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POLLUTION OF THE INTERSTATE AND INTRASTATE WATERS OF THE UPPER MISSISSIPPI RIVER AND ITS TRIBUTARIES -- MINNESOTA AND WISCONSIN

PROCEEDINGS OF CONFERENCE, SESSION (2ND), HELD AT MINNEAPOLIS, MINNESOTA, ON FEBRUARY 28, MARCH 1 AND 20, 1967. VOLUME 1

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Second Session
Minneapolis, Minnesota
February 28, March 1 & 20, 1967

Mississippi River
MINNEAPOLIS

Protection Agency
Branch, Room 2903

Conference

In the Matter of Pollution of the Interstate and Intrastate Waters of the Upper Mississippi River and its Tributaries - Minnesota and Wisconsin

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U. S. Department of the Interior
Federal Water Pollution Control Administration

336

Second Session of the Conference in the Matter of Pollution of the Interstate and Intrastate Waters of the Upper Mississippi River and Its Tributaries in the States of Wisconsin and Minnesota, convened at 9:40 a.m., on Tuesday, February 28, 1967, at the Leamington Hotel, Minneapolis, Minnesota.

PRESIDING:

Mr. Murray Stein, Assistant Commissioner for Enforcement, Federal Water Pollution Control Administration, Department of the Interior

CONFEREES:

Dr. M. M. Hargraves, Chairman of the Minnesota Water Pollution Control Commission

Lyle H. Smith, Executive Engineer, Minnesota Water Pollution Control Commission

Chester S. Wilson, Special Assistant, Attorney General, State of Minnesota

Dr. Demetrius G. Jelatis, Mayor of Red Wing, Minnesota

CONFEREES (Continued):

Freeman Holmer, Director, Department of Resources, State of Wisconsin

Theodore F. Wisniewski, Acting Chief, Division of Water Resources, Department of Resource Development, State of Wisconsin

O. J. Muegge, Member, Wisconsin Water Resources Advisory Board

Andrew C. Damon, Legal Counsel to the Department of Resource Development, State of Wisconsin

P. Odegard, Executive Director, Minnesota-Wisconsin Boundary Area Commission

H. W. Poston, Acting Regional Director, Great Lakes Region, Federal Water Pollution Control Administration, Department of the Interior

CONTENTS

PAGE

Opening Statement by Murray Stein — 3

STATEMENT OF:

Hon. Gaylord Nelson, United States Senator from the State of ~~Minnesota~~ Wisconsin — 14

Hon. Warren P. Knowles, Governor of the State of Wisconsin, as read by Mr. Freeman Holmer — 41

H. W. Poston, Conferee and Acting Regional Director, Great Lakes Region, Federal Water Pollution Control Administration — 44

Albert C. Printz, Jr., Sanitary Engineer, Federal Water Pollution Control Administration — 54

Lyle H. Smith, Conferee and Executive Engineer, Minnesota Water Pollution Control Commission — 300

PARTICIPANTS:

Hon. Gaylord Nelson, United States Senator from the State of Wisconsin

Albert C. Printz, Jr., Sanitary Engineer, Federal Water Pollution Control Administration

Frank E. Hall, Federal Water Pollution Control Administration, United States Department of the Interior, Great Lakes Region, Chicago, Illinois

Arthur V. Dienhart, Manager of Engineering, Northern States Power Company, Minneapolis, Minnesota

Kerwin L. Mick, Chief Engineer and Superintendent, Minneapolis-St. Paul Sanitary District, Minneapolis, Minnesota

John P. Badalich, City Engineer, City of South St. Paul, Minnesota

Otto Bonestroo, Consulting Engineer, Village of Cottage Grove, Minnesota

Arnold Steffes, City Engineer, Hastings, Minnesota

Robert F. Hubbard, Assistant General Superintendent, Cargill Corporation, Minneapolis, Minnesota

John J. Klein, Town Board of Supervisors, Eagan Township, Dakota County, Minnesota

John M. Mason, North Suburban Sanitary Sewer District

John G. Pidgeon, City Attorney, Bloomington, Minnesota

PARTICIPANTS (CONTINUED):

Mrs. William Whiting, President of the League of Women Voters of Minnesota

John Pegors, Vice President, Clear Air, Clear Water - Unlimited

Thomas C. Savage, Vice President, Fort Snelling State Park Association

Arthur A. Ebert, President, Minnesota Chapter, American Society of Sanitary Engineering

Robert E. Scheible, Chief of Sanitary and Electrical Engineering, Department of the Army, Headquarters, Fifth United States Army

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James Baird, City Engineer, City of Winona, Winona, Minnesota.

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Grady Boeck, Engineer, Brooklyn Park

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LIST OF ATTENDANCE (CONTINUED):

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Phil Duff, Daily Rep. Eagle, Red Wing, Minnesota

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Gary Ginner, Engineer, Minnesota Department of Health

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Dyane Hall, Manager, Rural Cooperative Power Association, Elk River, Minnesota

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LIST OF ATTENDANCE (CONTINUED):

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George Hopfenbeck, Jr., Attorney, ACS, 1200 American Nation Bank, Denver, Colorado

William B. Horning, Biologist, FWPCA, Minneapolis, Minnesota

Mrs. C. R. Humphries, League of Women Voters, Stillwater, Minnesota

LIST OF ATTENDANCE (CONTINUED):

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C. R. Humphries, President, St. Croix River Association, Route 5, Stillwater, Minnesota

Elmer Huset, Assistant Manager, St. Paul Water Department, 216 City Hall, St. Paul, Minnesota

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Demetrius Jelatis, Mayor, Conferee, Red Wing, Minnesota

C. H. Johannes, Public Health Engineer, Minn. Water Pollution, Minneapolis, Minnesota

Frank Hall, FWPCA, Chicago, Illinois

A. C. Johannsen, President, Izaak Walton League, Faribault, Minnesota

Robert Johnson, Reporter, St. Paul Dispatch

Dr. Walter Johnson, University of Minnesota

Philo Janes, Superintendent, Newport Cold Storage Company, Newport, Minnesota

Mrs. Glen Kaiser, President, League of Women Voters

Olin L. J. Kaupanger, Minnesota Emergency Conservation Committee, Minneapolis, Minnesota

LIST OF ATTENDANCE (CONTINUED):

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R. O. Laine, Attorney, 1228 West Hoyt Avenue, St. Paul, Minnesota

LIST OF ATTENDANCE (CONTINUED):

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Roland Larson, Manager, Bloomington Chamber of Commerce, Bloomington, Minnesota

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Malcolm K. MacKenzie, St. Peter Chamber of Commerce, St. Peter, Minnesota

Lowell Marsh, Secretary, Minneapolis-St. Paul Sanitary District.

Mary H. Marsh, Associate Editor, Newsletter, Am. Water Resources Association

LIST OF ATTENDANCE (CONTINUED):

Jack Mason, NSSD, Minneapolis, Minnesota

John M. Mason, Esquire, First National Bank Building, Minneapolis, Minnesota

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John McGuire, Minnesota Department of Public Health

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Martin Menk, Engineer, St. Peter, Minnesota

Kerwin Mick, Engineer, Minneapolis- St. Paul Sanitary District

Robert Miller, Chemist, Northwestern Refining Company, St. Paul Park

W. K. Montague, Attorney, 409 Alworth Building, Duluth, Minnesota

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John Moyle, Minnesota Division of Game and Fish

O. J. Muegge, Resource Development Board, State of Wisconsin

Jack Nelson, Superintendent, Parks Board, Pierce County, Ellsworth, Wisconsin

L. E. Nelson, Councilman, Hastings, Minnesota

LIST OF ATTENDANCE (CONTINUED):

Glen Northrup, Planning Director, Burnsville, Minnesota

H. Peter Odegard, Director, Minnesota Wisconsin Boundary Area, Hudson, Wisconsin

Albert Ofstad, W. S. Nott Company

Dr. Theodore Olson, Professor of Public Health Biology, University of Minnesota

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Albert Ostrin, President, Commercial Chemical, Shakopee, Minnesota

Mrs. G. E. Mann, League of Women Voters, Fergus Falls, Minnesota

Dale Bergstedt, Engineer, North Star Research Development, Minneapolis, Minnesota

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Julian Lauchner, Engineer, Southern Illinois University, Carbondale, Illinois

Robert H. Paddock, Engineer, U. S. Bureau of Public Roads, Madison, Wisconsin

Ward M. Parten, Long Lake, Minnesota

John Paulson, Student Burroughs School

LIST OF ATTENDANCE (CONTINUED):

John Pegors, Vice President, Clear Air Clear Water Unlimited

Robert Pendergast, Engineer, Twin City Testing Laboratory, St. Paul, Minnesota

Commander Gerard Perron, U. S. Coast Guard, Dubuque, Iowa

Donald Perwein, Assistant Public Health Engineer, State of Minnesota, University of Minnesota Campus, Minneapolis, Minnesota

Richard Peter, Engineer, Public Health, Rochester, Minnesota

Douglas Peterson, Superintendent, ACS, Chaska, Minnesota

M. Barry Peterson, T. C. Metro Planning Commission, St. Paul, Minnesota

John Pidgeon, Attorney, Bloomington, Minnesota

John Pingel, Health Protection Engineer, Argonne, Illinois

J. R. Porterfield, Superintendent, American Crystal Sugar, Denver, Colorado

H. W. Poston, Regional Director, FWPCA, 33 East Congress Parkway, Chicago, Illinois

John Rademacher, Chief, FWPCA, Washington, D. C.

LIST OF ATTENDANCE (CONTINUED):

Dan Reioux, Vice President, J. L. Shiely, St. Paul, Minnesota

Arthur Renquist, Attorney, NSP, Minneapolis, Minnesota

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William Ridge, Engr. Apprais., City Hall, Minneapolis, Minnesota

Roger Rieck, Recreation Resource - Department of the Interior, Ann Arbor, Michigan

George M. Robertson, Attorney, Winona, Minnesota

Maurice Robins, Chief Chemist, Minneapolis-St. Paul Sanitary District

Ira Rogers, Director, Public Affairs, Minnesota Employees Association, St. Paul, Minnesota

John Rose, Robbinsdale Sportsman's Club

Robert Rosene, Eagan Township, St. Paul, Minnesota

Dr. Clayton Rudd, President, Natural History Society, Minneapolis, Minnesota

Orlando Ruschmeyer, Instructor, University of Minnesota, Minneapolis, Minnesota

Rocco Russo, Oper. Manager, Cenex, Incorporated. South St. Paul, Minnesota

LIST OF ATTENDANCE (CONTINUED):

John Rutford, Minnesota House of Representatives, St. Paul, Minnesota

Paul Ruud, P. E. Engineer, Midland Consultants, Incorporated, Minneapolis, Minnesota

Clyde Ryberg, Administrative Assistant, Senator H. T. McKnight, Chaska, Minnesota

Franklin Ryder, Corps of Engineers, 1217 Post Office and Custom House, St. Paul, Minnesota

William T. Sayers, Deputy Project Director, FWPCA Twin Cities Project, Minneapolis, Minnesota

Thomas C. Savage, Fort Snelling State Park Association, St. Paul, Minnesota

Robert Scheible, 5th U. S. Army Headquarters, Chicago, Illinois

Marvin Schley, FWPCA, Minneapolis, Minnesota

Ed Schmid, Reserve Mining Company, Silver Bay, Minnesota

Robert Schoen, Chemist, American Crystal Sugar, Chaska, Minnesota

Richard L. Schroer, St. Paul, Minnesota

David Schuenke, Attorney, U. S. Department of the Interior, Solicitor's Office, Washington, D. C.

Howard J. Scott, Field Engineer, National Coal Association, Menomonee Falls, Wisconsin

LIST OF ATTENDANCE (CONTINUED):

Norman Sefer, Technical Director, Great Northern Oil Company, St. Paul, Minnesota

Donald Seiford, Vice President, Twin City Shipyard, St. Paul, Minnesota

H. J. Setzer, M.D., Izaak Walton League

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Otto Shelton, District Manager, Mid American Trans. Company, Minneapolis, Minnesota

John Skrypek, Minnesota Conservation Department, St. Paul, Minnesota

Lyle Smith, Engineer, WPCC, Minneapolis, Minnesota

Allen Sollie, Minnesota Conservation Department, St. Paul, Minnesota

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Lloyd Spriggle, Wisconson Conservation, Bay City, Wisconsin

Arnold Steffes, City Engineer, Hastings, Minnesota

Robert C. Sterrett, Archer Daniels Midland Company, Minneapolis, Minnesota

Mr$ H. Storlie, League of Women Voters

James Sullivan, Izaak Walton League, Minneapolis, Minnesota

LIST OF ATTENDANCE (CONTINUED):

Wayland Swain, Inst. School of Public Health, Minneapolis, Minnesota

F. C. Swan, Refinery Manager, Northwestern Refining, St. Paul, Minnesota

Donald Thimsen, Minnesota Department of Health WPC, Minneapolis, Minnesota

Thomas A. Thompson, Director of Public Works, Minneapolis, Minnesota

Mrs. R. H. Thommssen, Secretary-Treasurer, Minnesota-Wisconsin Boundary Area Comm.

Richard Thorpe, Minnesota-Wisconsin Boundary Comm.

Joyce Tritschler, League of Women Voters

Frances Tustison, Secretary, FWPCA, Naval Air Station

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George Walker, Honeymead Products Company, Mankato, Minnesota

LIST OF ATTENDANCE (CONTINUED):

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E. L. Weber, Asst. Comm., State Fire Marshal, St. Paul, Minnesota

Mrs. William Whiting, President, League of Women Voters, University of Minnesota

Arthur Whitney, Attorney, North Suburban Sanitary Sewer District

William Williams, Councilman, Cottage Grove, Minnesota

Betty Wilson, Press, Rosemount, Minnesota

Theodore F. Wisniewski, Acting Director, Water Resources Division, Wisconsin Department of Resource Development, Madison, Wisconsin

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PROCEEDINGS

OPENING STATEMENT

BY

MR. MURRAY STEIN

MR. STEIN: The conference is open.

This conference in the matter of pollution of the interstate and intrastate waters of the Upper Mississippi River and its tributaries in the States of Wisconsin and Minnesota, is being held under the provisions of Section 10 of the Federal Water Pollution Control Act, as amended. The Secretary of the Interior is authorized to call a conference of this type when requested to do so by the Governor of a State, and when on the basis of reports, surveys, or studies, he has reason to believe that pollution of interstate waters subject.to abatement under the Act is occurring.

In a letter dated September 9, 1963, Governor Karl Rolvaag of Minnesota requested a conference, as did Governor John Reynolds of Wisconsin, in a letter dated September 17, 1963.

In accordance with these requests, as well as on the basis of reports, surveys, or studies, a Federal-State enforcement conference was held on February 7-8, 1964, in St. Paul, Minnesota.

The purpose of the conference is to bring together representatives of the State water pollution control agencies, representatives of the Federal Water Pollution Control Administration, and other interested parties, to review the existing situation, the progress which has been made, to lay a basis for future action by all parties concerned, and to give the State, localities and industries an opportunity to take any indicated remedial action under State and local law.

The conference technique is rather an old one. It is used by many States informally in the normal conduct of their business in the field of water pollution control. The concept of the conference was proposed by the United States Supreme Court as long ago as 1921 in the famous case of New York against New Jersey involving interstate pollution. I would like to quote briefly from the Court's opinion:

> "We cannot withhold the suggestion, inspired by the consideration of this case, that the grave problem of sewage disposal presented by the large and growing population living on the shores of New York Bay is one more readily to be most wisely solved by cooperative study and by conference and mutual concession on the part of representatives of the

States so vitally interested in it than by proceeding in any court however constituted."

We strongly support the conference technique and we measure our success by the situations which are solved at the conference table rather than in the courts.

As specified in Section 10 of the Federal Water Pollution Control Act, the official water pollution control agencies of Wisconsin and Minnesota have been notified of this conference. The Wisconsin Department of Resource Development is being represented by Mr. Freeman Holmer, Mr. Theodore Wisniewski, Mr. O. J. Muegge, Mr. Andrew Damon, Mr. P. Odegard, and Mr. Alan Kirschner, who I understand will be here later.

The Minnesota Water Pollution Control Commission is being represented by Dr. M. M. Hargraves, Mr. Lyle Smith, Mr. Chester S. Wilson, and Mayor Demetrius Jelatis of Red Wing, Minnesota.

You can see we have quite a forum up here of conferees.

The Federal conferee is Mr. H. W. Poston, who is Director for this region of the Federal Water Pollution Control Administration, with headquarters in Chicago, Illinois.

My name is Murray Stein, and I am from headquarters of the Federal Water Pollution Control Administration in Washington, D. C., and the representative of Secretary Udall.

As I look at this group of conferees, one of my functions is to be sure, looking at the shortage of Federal people, that nothing comes to a vote.

(Laughter.)

I would like to welcome the conferees as old friends, and one in particular, Chester Wilson, whom I think all of us owe a debt of gratitude too, because, if I may say, more than anyone else he is the man I learned the business from many years ago. He is really the grand old man of water pollution control, and worked in this for many, many years.

The parties to this conference are the Wisconsin Department of Resource Development, the Minnesota Water Pollution Control Commission, and the United States Department of the Interior. Participation in this conference will be open to representatives and invitees of these agencies and such persons as inform me that they wish to present statements.

Now, this is under the new amendment to the law, but I would suggest before you see me, if you are from either one of the States, that you try to make arrangements with your State agencies, because we prefer that the States manage their own time.

However, only the representatives of the official

State water pollution control agencies and the United States Department of the Interior constitute the conferees.

Both the States and Federal governments have responsibilities in dealing with water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage the States in these activities.

At the same time, the Secretary of the Interior is charged by law with specific responsibilities in the field of water pollution control in connection with pollution of interstate and navigable waters. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters, whether the matter causing or contributing to the pollution is discharged directly into such waters, or reaches such waters after discharge into a tributary, which endangers the health or welfare of any persons, is subject to abatement.

The first session of this conference, as indicated, was held on February 7-8, 1964. At the first conference session, the conferees unanimously agreed to the following conclusions and recommendations:

1. Pollution in these waters from industries, municipalities and storm overflow sources has created

a health hazard to persons engaging in water contact activities, causes visual nuisances, interferes with fish and fishing, causes sludge banks which give off noxious odors, and floating sludge, and interferes with bottom aquatic life, and with feeding and spawning grounds for fish propagation. This pollution must be abated.

2. The Wisonsin and Minnesota water pollution control agencies have active water pollution control programs. The delays, if any, are those which may be expected to occur in the execution of the pollution abatement program of a large metropolitan area.

3. The Federal water pollution control program in conjunction with both State agencies and in keeping with State staff and fund limitations, is to conduct an intensive survey of the Mississippi River. Participation is to be on a cooperative basis by all agencies, both on the technical level and in advisory and policy direction capacities. This study project is to include but not be limited to investigation of municipal, industrial, and Federal installation wastes, thermal sources of pollution, agricultural sources of pollution, bulk storage areas, pipelines, barges, coliform bacteria, BOD,

suspended solids, sludge deposits, oil, algae, tastes and odors, pesticides, and with the cooperation of the Corps of Engineers, low flow augmentation. The study can be modified or expanded at the request of the technical committee.

4. At the suggestion of the Wisconsin conferee, the conferees agreed that the study area be extended to include St. Croix Falls, Wisconsin, and Taylors Falls, Minnesota.
5. The study and report is to be planned and carried out so that features relating to Twin City metropolitan area sewage disposal will be completed, if at all possible, in time to report the findings and recommendations by January 1965, and the opening of the 1965 Minnesota State Legislature.
6. This study is not a substitute for, but a supplement to, already existing State programs for pollution control and abatement.
7. At the completion of the study and the report of its findings, the conference will be reconvened at the call of the Chairman of the conference to determine necessary action.

As you see, we are almost as good as our word, just slightly late, and I think part of this has to do with the complicated problem that we found. However, on thing I can say is that when we promised to be back after we do a study, we do come back, and we don't file a report on the shelf to gather dust.

The study of the Upper Mississippi has been completed. Accordingly, this conference has been reconvened to consider and evaluate the report of the study findings and to determine necessary action to be taken in the study area.

Now a word about the procedure governing the conduct of the conference. The conferees will be called upon to make statements, and the conferees may call upon participants whom they have invited to the conference to make statements. In addition, we will call upon any other interested individuals who wish to present statements. At the conclusion of each statement, the conferees will be given an opportunity to comment or ask questions, and at the conclusion of the conferees' comments or questions I may ask a question or two. This procedure has proven effective in the past in developing a clear statement of the problem and in reaching equitable solutions.

At the end of all statements we will have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we will attempt to summarize the conference orally, giving the conferees, of course, the right to amend or modify the summary.

After the discussion here, we will consult the conferees later. The way this might be handled is that the conferees may go into executive session and have an announcement to make after the executive session.

Under the Federal law, the Secretary of the Interior is required at the conclusion of the conference to prepare a summary of it, which will be sent to all the conferees. The summary, according to law, must include the following points:

1. Occurrence of pollution in navigable waters subject to abatement under the Federal Act;
2. Adequacy of measures taken toward abatement of pollution; and,
3. Nature of delays, if any, being encountered in abating pollution.

However, if there are any modifications of these desired by any of the conferees, I think we should consider these.

The Secretary of the Interior is also required to make recommendations for remedial action, if such recommendations are indicated.

A record and verbatim transcript will be made of the conference by Mr. Al Zimmer. Mr. Zimmer is making this transcript for the purpose of aiding us in preparing a summary, and also providing a complete record of what is said here. We will make copies of the summary and transcript available to the State agencies. We have found that, generally, for the purpose of maintaining relationships within the States, that the people who wish summaries and transcripts should request them through their State agency rather than come directly to the Federal Government. The reason for this is that when the conference has been concluded, we would prefer that the people who are interested in the problem to follow their normal relations in dealing with the State governments, rather than the Federal Government, on these matters. This has worked successfully in the past, and we will be most pleased to make this material available to the States for distribution.

I would suggest that all speakers and participants making statements, other than the conferees, come to the lectern and identify themselves for the purpose of the record.

I would like to suggest, in view of the number of conferees here, that the conferees do the same, because I do think the man who is the reporter and faces a group like this, is like being faced with taking a transcript of the legislature without being familiar with the cast of characters. Until he becomes familiar with that, I think it would be better practice if the conferees would identify themselves too.

Before we get into the conference, I believe we have a distinguished member of the President's Federal Water Pollution Control Advisory Board in the room, the only representative of the Advisory Board from Minnesota and this part of the country. He is an attorney in town. I wonder if he would stand up?

Mr. Raymond Haik. There he is.

(Applause.)

MR. STEIN: Thank you.

Mr. Haik has been very helpful in providing us with guidance on the general operations of the program, particularly with relation to the Enforcement Section, and we appreciate his constructive criticism.

At this point I would like to call on another one of my bosses in Washington. When we come to the office, until the phone rings and you get a call from the Hill or the Capitol, you don't know which one of your bosses is calling you up. I would like to say that in addition to the people downtown, we have 535 up on the Hill. However, not all of them pay that much attention to water resources.

This gentleman has been one of the guiding spirits in the Congress on water resource legislation, water pollution legislation, specific pollutants, and the elimination of them. He is one of a handful of men in the legislative body who knows probably as much about our program or the conditions of water resources in the United States as anyone.

Senator Gaylord Nelson.

(Applause.)

STATEMENT OF THE HONORABLE GAYLORD NELSON, UNITED STATES SENATOR FROM THE STATE OF WISCONSIN

SENATOR NELSON: Mr. Stein, Conferees from the State of Wisconsin and the State of Minnesota, and Mr. Poston, the Federal Representative:

I appreciate very much the opportunity to appear here this morning.

My statement is brief. I am a member of the Senate and the committee, but I am not here as a representative of that committee. I am here as a representative of Polk County. I am glad that your map-makers put my county up on the river there (indicating).

I am here as a private citizen, having been born and raised on the Upper St. Croix River, and one who is concerned, as I know all of you are, about the preservation of the quality of that river, as well as the restoration of the quality of the Mississippi River.

In all the almost twenty years that I have had the privilege of being in public office, I have not seen a more distinguished panel of concerned citizens than the panel convened here of conferees from Wisconsin and Minnesota to consider this report.

I have read it three times now. My comments will certainly not be directed to any of the specific details.

There may be those here today who may have some observations or suggestions as to the details of the approach to this problem. I think it is a very fine report. I think it tackles one of the most important problems that this country faces.

One of the additional reasons that this is a particularly important conference is that it is, I hope, the beginnings of an approach to the solutions of the pollution of one of the greatest watersheds in the world, the Upper Mississippi.

I would hope that we would have succeeding conferences from here all the way to the Gulf of Mexico, and that in the next decade we will lick the whole problem of the quality of the water of the Missisippi.

I want to commend the conferees and the technical

Hon. G. Nelson

members who have participated in putting this report together.

The release of the report on pollution of the upper Mississippi River and its major tributaries represents, I think, a significant milestone in this Nation's battle against water pollution. At the outset, I would like to commend all the people who have been involved in the making of this precedent-setting report.

We all owe a debt of gratitude to former Governors John Reynolds of Wisconsin and Carl Rolvaag of Minnesota, who had the courage and foresight to call for this conference.

The members of the conference, including the representatives from Wisconsin and Minnesota, the Chairman of the conference, Mr. Murray Stein, and the many experts from the Federal Water Pollution Control Administration who have worked on this project deserve the highest praise for what I think is an outstanding job they have done.

To a large extent the success of a study such as this depends on the support of the industries, municipalities and private citizens who are involved. As we enter the second phase of this program -- the abatement phase -- the support of these people becomes even more critical because they are charged with the responsibility of rectifying the pollution situation which the report indicates exists in the upper Mississippi and its tributaries.

And to these very same people falls the ultimate responsibility for maintaining clean water once it is flowing again in these rivers.

The great challenge of stopping water pollution in this country is directed to these groups of people -- the industries, the municipalities, the concerned citizens. Without their support and cooperation, the waters of this Nation will never be cleaned up.

MR. STEIN: Senator, I am going to violate the first rule of a bureaucrat. I never wanted to interrupt a Senator, but perhaps you won't mind. You talk in terms of industries, municipalities, and concenred citizens. How about the group such as we have here -- our State and Federal participation? Do you think that a group of that kind has a part in this?

SENATOR NELSON: Yes, Murray. I think I make reference later on to the Federal Government and the States.

The fact of the matter is, Mr. Stein, that water is in interstate commerce, almost all of it, and that the only way this country will clean up its waters, its rivers and the Great Lakes, is by Federal-State conferences, which bring all the parties together, regardless of State or city or county boundaries, and evaluate the problem, sitting down at a conference such as this with a specific proposal, and with deadlines for meeting compliance with the proposals.

As you know better than anybody else in this room, we have had a number of State-Federal pollution conferences in the United States, and they have been remarkably successful. If you had told me a half a dozen years ago that you would ever get the City of Detroit and some 56 industries together on an agreed plan to clean up the Detroit River, I would not have believed you. You completed that conference a few months ago.

I think it is one of the most remarkable accomplishments in the field of water pollution control that we have ever had in the United States, because it involved a tremendous city; it involved some of the biggest industries in America; it involved some of the most complicated problems that have ever been confronted in this field; and after discussing it at considerable length, there was an agreement among the industries and the City of Detroit on a proposal from the conferees to clean up the water there.

I don't think there really is any other way that we can successfully clean up the waters involving interstate pollution other than this kind of a conference, and, as I said, I hope this is the beginning of a series of conferences that will go from here to the Gulf of Mexico.

I also hope it calls to the attention of the people of Minnesota and Wisconsin additional problems, one of them involving Lake Superior, which is the second greatest body of fresh water in the world, in terms of surface acreage the largest body of fresh water in the world; and in terms of water capacity next to Lake Baikal in Russia. The second greatest body of fresh water in the world, that lake, is now being polluted by Duluth and Superior and other municipalities.

I would hope, Mr. Stein, that you and your people would give some consideration after this conference to an evaluation of that situation, so that we can get a conference and get a program of abatement of pollution of Lake Superior, since it is one of the most delicate bodies of pure water any place in the world, and we ought to tackle that one next. Then Lake Michigan after that.

However, to answer your question, I don't think there is any other way to do it than to bring together all of the people representing the State governments and representing the industries and the citizens of the various States, since all of this does involve interstate pollution and not just intrastate pollution.

I think it is appropriate at this time to note that the sole purpose of this conference report is to suggest a constructive and practicable program to restore the water quality to an acceptable level.

Hon. G. Nelson

The great honesty and integrity of the report of this conference is gratifying to every concerned citizen. Many people have recognized the pollution of the upper Mississippi and its tributaries for many years. I am certain, however, that none of us have realized the magnitude of the problem as revealed by the report. The facts are that these waters are perilously close to being a huge cesspool.

The report spells out a debasement of water quality in this reach of the river which is certainly unacceptable to any thoughtful citizen. We are not here, surely, to assess blame and to wrangle about responsibility. The fact is the whole Nation is responsible for the degenerated condition of our fresh water resources. The river water here is hardly better or worse than other major rivers. Every major river basin from coast to coast is polluted, to one degree or another. We all condoned it; we all participated in it; we all share the responsibility. Historically, all civilizations used their water courses as the conduit for waste disposal. Because of the remarkable capacity of water to cleanse itself, this worked very well up until recent years. In the past half century we have increasingly loaded streams beyond their natural capacity, and we have introduced new industrial wastes that are not biologically degradable.

I am sure that if we could turn the clock back fifty years and had the benefit of hindsight, all of us -- municipalities, the Federal Government, industries and the general public -- would agree to pay the cost to prevent the damage from occurring in the first place.

The problem now is to look to the future and rectify a problem it is within our power to cure. That involves first a frank recognition of the existing situation. The report points out very vividly that America's greatest river is being pumped full of human wastes and industrial sewage, and is disturbingly contaminated with typhoid bacteria, polio virus, and so forth.

Municipal sewage plants on the upper Mississippi discharge millions and millions of gallons of sewage into the river each day; contained in this sewage are oxygen consuming wastes equivalent to raw sewage from a population of one million people and coliform bacteria equivalent to raw sewage from a population of 1,200,000 people. The Twin Cities area has an estimated population of 1,500,000 people; the amount of pollutants being pumped into the Mississippi each day from these treatment plants is roughly equivalent to the pollution that would be caused by dumping the untreated sewage of all the inhabitants of the metropolitan area directly into the river.

Industries along both the Mississippi and

Minnesota Rivers each day are dumping tremendous amounts of dangerous chemicals, as well as coliform bacteria and oxygen consuming wastes, into these waters. Phosphates, ammonia and organic nitrogen all stimulate algal growth that, in turn, creates a nuisance condition which adversely affects water supplies and recreational uses. Phenols make the waters smell and impart a strange taste to the water as well as to the fish which live in that water.

The report contains many more seriously disturbing statistics. I don't think it is necessary to go through them all here. In the final analysis, the report offers a tremendous challenge to the people of Wisconsin and Minnesota to take the firm steps necessary to save the river.

The remedial program recommended in the report, I think, is a sensible one. By spreading the abatement program over a three-year period, the conference recommendation does not impose undue hardship on anyone involved. I am confident that an orderly approach to resolving this problem will lead to a more satisfactory solution.

The State-Federal conferences around this country have produced excellent results elsewhere in the past few years, and I am sure this one will be every bit as fruitful as those conferences that have been held elsewhere in this country. The technique has brought representatives of the

States of Minnesota and Wisconsin and the Federal Government to the conference table to discuss with industry and local units of government a reasonable course of pollution abatement. In the long run, cooperative efforts of this type by all levels of government, concerned citizens and industry, will lead to a better America, a finer environment in which to live.

When we consider the Mississippi River Basin is one of the most significant watersheds in the world, it is indeed an exciting prospect to consider its restoration as a high quality water resource for recreation, municipal and industrial use. This should be but the first of a series of conferences aimed at cleaning up the river from here to the Gulf of Mexico. A clean and clear Mississippi will repay the investment one-thousand-fold in esthetic, recreation and economic value. Some time ago a similar conference was called for the Indiana and Illinois waters of Lake Michigan and a clean-up program is now under way. Similar conferences, as I said previously, are needed for other Lake Michigan waters and for the Duluth-Superior Harbor, where priceless water assets are slowly but surely being destroyed.

I might add, Mr. Chairman, that many times the question is raised about the cost and so often people will say, "Well, we will put industry to a competitive disadvantage in the expenses created." The fact of the matter is that the value of fresh water far surpasses the cost of cleaning it up.

In this country today there is available about 600 billion gallons of water for daily consumption. The total available supply in America is 600 billion gallons a day. The daily consumption in this country now is 340 billion gallons a day.

By the year 1980, which is thirteen years away, we will be using 600 billion gallons of water daily in this country, the total national supply; and by the year 2000, which is a little over thirty years away, we will be using 1,200 billion gallons of water per day, by the best estimates of the hydrologists who testified before our committee in Congress. We will then, thirty-three years from now, be using twice the national supply of fresh water daily, which means, of course, that on the average we will use the water twice; but since water is not equally distributed in this country, it being in greater abundance in many places where there are fewer people, what really is going to happen is that in the great metropolitan areas on the East Coast and here in the Midwest, we will be using water ten, twenty, or thirty times. The Mississippi River will be used ten, fifteen, twenty times, and if every industry and every municipality has to take dirty water out of the river, pay the cost of cleaning it up so that it is potable or usable for industrial and municipal purposes, return it to the river dirty, and does that ten or fifteen times, the cost of doing that will be prohibitive.

So, from a pure investment, economic standpoint, the cheapest and most economical thing we can do is clean up the Mississippi River from the beginning to the end, and this apart from the fact that a clean river such as this great river affords an additional benefit of recreation, with all of the esthetic values that go with that, plus the economic value that goes with having an attractive source of recreation for people from all of the United States.

Now, Mr. Chairman, I had just one question that I was not sure about in reading the report.

On Page 32 of the report, in the left-hand column, it says:

> "SPECIFIC RECOMMENDATIONS - ST. CROIX RIVER
>
> Municipal Sources
>
> No specific recommendations.
>
> Industrial Sources
>
> No specific recommendations."

I have not had the chance to look at the detailed report. I am not exactly sure what this means, but in looking at the report itself, I note with gratification that the lower St. Croix, by any comparative terms that you have considered around this country, is one of the cleanest rivers there is.

Incidentally, I asked the Department of the Interior a year ago to see if they could find another river in America this close to a metropolitan complex that was unpolluted, and, so far as I can find out, this is the only major river in a metropolitan area in all of the United States which is still relatively unpolluted.

Of course, the reason is the Mississippi runs through the cities, and nobody got onto the St. Croix to pollute it, but it is a remarkably important river.

I note that St. Croix Falls from my hometown in Polk is introducing some pollutants. So is Taylors Falls; so is Hudson; so is Stillwater; and I am wondering why the report does not suggest specific recommendations for meeting that.

MR. STEIN: Well, I believe the persons who prepared the report will come up.

I had the same question as you. Senator.

Let me indicate I agree with you on the value of the St. Croix River, because in the Department of the Interior I had received some questions and we did examine the river in the United States. We did find the Allagash River in Senator Muskie's State, but it would probably take a day and a half to get up there from any paved roads. This is one of the few rivers near a metropolitan area that is a clean stream, and it is a delight at the present time and is something which should be preserved.

What has been done in this report is that we have general and specific recommendations. Maybe we lawyers will have to flip and try to figure out how the engineers do things. They love to factor things out.

They have made general recommendations. These apply to the St. Croix River. I think the time schedule is the same, and the recommendations as to a clean-up are about the same.

When they talk about specific recommendations, they mean those recommendations in addition to the general recommendations that will have to be made to clean up a particular pollution situation because of the nature of that situation.

I think we can consider ourselves pretty lucky in the St. Croix River by finding that the general recommendations will be sufficient to clean it up. We should be happy to find that they don't have any kind of exotic or esoteric problem for which you need a specific recommendation, but the general recommendations will be sufficient.

SENATOR NELSON: Then, as I understand you, the municipalities on the Wisconsin side and the Minnesota side of the river, if the conference recommendations are approved, will then be required to comply with a water quality standard, just as industries?

MR. STEIN: That's right. For example, as I read the report, the general recommendations call for all municipalities providing secondary treatment and chlorination of the effluent. If the municipalities and industries on the St. Croix would do this, this would handle it.

While we are on this, Senator, you mentioned Lake Baikal. I would like to make a comment and then ask you whether you would make a comment on this.

I certainly was interested in your analysis of the Russian lake. I have never been able to find out how deep that lake is, and how much water those Russians have in it. I wish I could get some information on it.

Other than that, as you know, the Great Lakes are our greatest source of fresh water supply on this continent, and probably the greatest single source of fresh water supply in the world. Lake Superior, so far as we have been able to determine, is in the best condition of all the Great Lakes.

We were out at Lake Tahoe, which is the purest you can find, I guess of the water around, and even that is threatened.

I think the issue is this: When you get pollution of one of the lakes, once a lake goes, I don't know that you can turn back the clock and restore that lake.

We have had tremendous success in Chicago, and I think we are having success in Lake Erie. We have had success in the Detroit River, because these people are faced with a catastrophe, and they know it. We have had this Great Lakes litigation for years. You have been litigating against their putting the effluent back in the lake.

If those lakes go and we lose that fresh water resource, the whole economic structure of the midwestern States and perhaps the economic strength of the United States may decline. That is how important this resource is. However, you have a different situation here. You have a river and your problem in a sense is easier, but being easier, it presents a more subtle challenge.

Generally speaking, the wastes in this area are amenable to known methods of treatment. You don't have the same problems that we have in some of these other river basins in the country. Presumably, once we clean up these wastes and keep the Mississippi River clean, we can have a clean river and restore it.

The question is whether we can relax in a situation like this, at a time when we don't have the hard catastrophic event facing us, when we are ready to do the job here.

You spoke of the whole Mississippi River, Senator. As an old, experienced water resource man working in this field -- I see the Corps of Engineers people are here -- I know full well the history of flood control on the Mississippi River. On the Mississippi River, the American people have had devastating flood after devastating flood right through the 1920's and the '30's and the '40's before we did anything about it. The question here is whether we are going to have to face this catastrophe here or whether we are going to be wise enough, it seems to me, to deal with the problem that we know how to deal with before this happens.

SENATOR NELSON: I realize that your concern here today is the Mississippi River, and I certainly did not want to divert the conversation to some other business, because this is very important business, but I could not pass up the chance to say something before such a distinguished panel, which has some authority to do something about it.

As I say, it would be a great step to continue with it after this. Our problem in this country is that we let the waters become polluted, and then we have a great outcry, such as on Lake Erie, and then we say, "Let's do something about it."

We are sitting here with the two greatest bodies of water in the world, the Mississippi and Lake Superior, and now is the time to do something about it.

I appreciate very much the chance to appear here today, and I again want to commend the technical staff and those who have put together this very fine report.

MR. STEIN: I wonder if I could ask the conferees if they have any comments or questions?

DR. JELATIS: Mr. Chairman, I am Mayor Jelatis from Red Wing.

I think I should challenge one of the statements that Senator Nelson has made, and, if I quote correctly --

SENATOR NELSON: I consider it lucky if you only challenge one.

(Laughter.)

DR. JELATIS: I think you said none of us recognize the magnitude of the problem as presented in this report.

I see many people here in the audience who have lived downstream, as we have in Red Wing, that have recognized the magnitude of the problem, and I am sure the turn-out here shows the interest in the problem.

SENATOR NELSON: None of us who don't live on the river, I should have said.

(Laughter.)

MR. STEIN: Are there any further comments?

I meant to ask one last question, Senator.

As a member of the Interior Committee, and this is the committee which is concerned with water resources and the water resource questions in our Department, you have read this report.

Do you think that the solutions here presented in the report are practical solutions?

SENATOR NELSON: I have read just about every report that has come out of the Federal-State conferences in the past ten years. I think this is the finest one that I have seen. I think it is, without attempting to judge the case, since I don't feel qualified to make any comment as to how one detail or another might affect one municipality situation, or an industry situation, but I would say overall that it is a very, very reasonable report with very reasonable recommendations. I see nothing in it that cannot be complied with.

What you are suggesting is a water quality standard that can be met by the treatment and the equipment that we have already manufactured in this country to meet this state of the art. I see nothing unreasonable about it.

I think it is a very fine report in general, without attempting to make a judgment on some particular detail.

MR. STEIN: Yes.

MR. WILSON: Mr. Chairman?

MR. STEIN: Yes, sir.

MR. WILSON: May I just make a brief comment, seconding what has just been said by my colleague from Red Wing in reference to the Senator's intimation that no one recognized the magnitude of this problem before this report?

I might say by way of introduction, although I think it is quite well known to a good many here, that my contact with this interstate pollution problem on the Mississippi and the St. Croix Rivers probably goes back much further than anyone else's in this audience, back to the days when your State Board of Health, after World War I, the Minnesota State Board of Health and the Wisconsin Board of Health, were struggling both with their intrastate and interstate pollution problems, without benefit of any special water pollution control agencies, and making considerable progress therewith.

Both of those agencies recognized the magnitude of the problem on the Mississippi River, which in those days was going from bad to worse into a state of pollution.

As a result of the efforts of the Minnesota

State Board of Health, without any Federal intervention whatsoever, because no Federal law existed for water pollution control activities at that time, the Twin Cities got their resources together, organized the Minneapolis-St. Paul Sanitary District, and proceeded at great expense to construct the Twin Cities Sewage Disposal System and Treatment Plant at Pigs Island, which was the first of its kind in any metropolitan area on the entire interior river system of the country.

The result of that was that the people downstream below the Twin Cities for the following twenty years enjoyed a cleaner river than anywhere else on the Mississippi, Ohio or the Missouri Rivers.

Duluth was likewise ahead of all other communities in providing sewage disposal and treatment at the head of the lake.

The present situation resulted, as everyone knows, I think, from the fact that the population explosion of recent years outran the estimates of the engineers who constructed those earlier systems. That also was recognized by these State agencies of both States, notably by the Minnesota Water Pollution Control Commission, which in the meantime had been created in 1945.

The Commission called the attention of the Twin

Cities Sanitary District Board of Trustees to this situation, that the population explosion and the growth of industry in this Twin Cities area was exceeding their previous estimates as to the capacity of their plant, and that in the course of a very few years, it would become overloaded if not expanded.

The Board of Trustees of the Twin Cities plant undertook a study of this situation, and it became very evident that in order to deal with this problem, there would have to be an expansion of the authority of that district to cover the entire metropolitan area.

The Twin Cities Sanitary District, when first created and now, was limited to the boundaries of the two contiguous cities of Minneapolis and St. Paul. Its authority to deal with suburban problems was limited to the making of contracts by the separate cities to take care of the sewage through the main systems of these suburbs.

That was a very unsatisfactory way to take care of this expanding outside population, because it did not provide adequate legal or financing authority to build the immense interceptor sewers which were going to be necessary to take care of that outside population in time to prevent the overloading. The authorities of the district sought action by the State Legislature.

Now, I was raised on the St. Croix River, where,

Hon. G. Nelson

in early days we had a lot of log jams, and when you had to loosen up a log jam you had to find the key log, and I am going to say that the key log in this jam with which we are confronted now is in the Minnesota Legislature through failure to heed these recommendations of the State Water Pollution Control Commission and the Board of Trustees of the Twin Cities Sanitary District, and provide the necessary authority to get on with the job fast enough.

At the Legislature of 1961, in response to these efforts, a bill was introduced to provide for expansion of the sanitary district. It was not passed, and accordingly the district then proceeded with the utmost means at its disposal to plan for and launch the expansion project which is now on the point of completion.

The completion of that project had a much higher cost than the construction of the original plant which was completed in 1938. The completion of that project, which was initiated without any Federal intervention whatsoever, will result in a very substantial clean-up of the Mississippi River below the Twin Cities.

It will not make it good enough. We should not kid ourselves about that. Much more must be done. South St. Paul has got to make some very marked improvements, and all the other communities on the Minnesota River and the tributary streams.

Hon. G. Nelson

The Minnesota Water Pollution Control Commission is on the way to deal with those problems, and I think it is fair to say that if it had not been for those oil spills in the winter of 1962 which got everybody stirred up -- and, of course, it is a great American custom that hardly anybody moves to deal with a big problem in this country until some calamity happens -- those oil spills for which the Minnesota Water Pollution Control Commission, according to the findings of the State Board of Health, was in no way responsible, got everybody stirred, with the result that the Legislature passed some legislation at the 1963 session which improved the situation somewhat, but still did not provide the necessary authority for expansion of this district.

However, in the meantime this expansion project was actually going on, and if you ask me, on the basis of considerable experience as Chairman of the Minnesota Water Pollution Control Commission in past years, as legal consultant for the State Board of Health, having held the first hearing for them under the Federal Water Pollution Control Act, and some considerable familiarity with these problems in different parts of the country, I think that this problem would have been solved without any Federal intervention in the law by the initiative of the Minnesota Water Pollution Control Commission and State Board of Health and the cooperation of the Wisconsin authorities.

Now, maybe it would not have proceeded quite so fast. In fact, I am sure that those oil spills were a very potent factor in getting the Legislature in 1963 to pass the laws that they did, and also those oil spills were responsible for the calling of this conference. If those oil spills had not occurred, I don't think we would be here today at all.

I don't blame the Governors of the two States for asking the Federal Government to come in here, and I think the expenditure of the money that has been spent on this effort by the Federal authorities has been very beneficial, because they have done a great deal which the Minnesota Water Pollution Control Commission did not have the money to do. But the Water Pollution Control Commission was fully aware of the existence of all the sources of pollution to which attention is called in this report, and has already started to deal therewith by holding a series of hearings in 1962 for the purpose of establishing standards and taking enforcement action before anybody thought of calling this conference, or calling any Federal authorities.

Now, getting right back to the key log of this jam, the important thing at the door of the Minnesota Legislature right now is to enlarge that sanitary district so that it will have the legal authority and financial capacity to construct the large works which are necessary to prevent another overloading.

As I say, the completion of this present project, together with what has to be done at South St. Paul and the other communities, will do very much to clean up this river, but the capacity of that is limited, and unless this legislature provides for an adequate authority to anticipate needs and construct these interceptors to deal with the problems before they occur, we will be in another overloading jam between five and ten years from now.

I personally am glad that the Federal authorities have come in here and made the study that they did, because I think they might be quite helpful in getting this matter through in the Legislature, which has now passed up three sessions without acting on this problem of the expansion of the district. I hope that it will be helpful in getting the Legislature at this stage to take that action which will forestall another jam.

And, may I say, Senator, as a life-long citizen of Stillwater, Minnesota, that the citizens of Stillwater, Minnesota, of Washington County, Minnesota, and of the State of Minnesota, are just as concerned and just as vigilant to protect the natural advantages of the St. Croix River which they, above all people, prize most highly as anybody, anywhere, including the State of Wisconsin.

MR. STEIN: Thank you for your statement, Mr. Wilson.

You know, that goes to show you what happens when you pour oil on troubled waters.

(Laughter.)

Senator?

SENATOR NELSON: I just would like to say that Chester Wilson is one of the distinguished conservationists in this country, and if you would write that speech out, I will go up there and give it to the Legislature.

(Laughter.)

For reasons that you may not suspect, I am most grateful for the criticism that you and Dr. Jelatis have made. This is the first time in my life that I have ever been accused of understating a pollution problem.

(Laughter.)

I am glad today to say it happened.

I am not going to leave the conference. However, I have to call my office and see what's going on in Washington, and see to it that they don't spend any money while I am gone. I will be right back.

MR. STEIN: Thank you very much.

(Applause.)

MR. STEIN: At this time I would like to call on Mr. Freeman Holmer for a statement of Governor Warren P. Knowles of Wisconsin.

STATEMENT OF HON. WARREN P. KNOWLES, GOVERNOR OF THE STATE OF WISCONSIN, AS READ BY MR. FREEMAN HOLMER, A CONFEREE

MR. HOLMER: Recognizing the importance and significance of this conference, Governor Knowles was unable to be here and asked me to present to the members of the conference and those of us who are attending and considering this subject with us, a relatively brief statement of his support of the conference and his hope for its success.

Mr. Chairman, Members of the Federal-State Conference on Water Pollution of the Upper Mississippi:

Three years ago, my predecessor joined with the then-Governor of Minnesota to request a conference on the pollution of the upper Mississippi River and its major tributaries.

The summary contains a substantial amount of information, very little of which is new to those of us who have been concerned with doing something to correct the situation.

Although only a few of the installations affected by the specific recommendations of the Federal Water Pollution Control Administration are located in Wisconsin, I can assure you that we in Wisconsin plan to use our resources to assure compliance with the conclusions of your conference. The expanded staff authorized by the 1965 Legislature and the further expansion of staff and local assistance grants included in my budget recommendations for 1967-69 exceed substantially the suggestions incorporated in the summary report and are evidence of this intention.

Wisconsin's representatives at the conference will have a number of suggestions for specific modification of the recommendations. For example, we cannot condone, under Wisconsin law, either the operation of an open dump or a sanitary landfill in a flood plain (Sec. 144.045, W.S.). We have a question relating to storm waters. There are others.

The clean-up of the Mississippi can only occur rapidly and effectively with determined State and local leadership. I am sure that your conference provides a focus of public attention on the problem on one of our boundaries.

We are already moving to cope with the problems of our other inter- and intrastate waters. We welcome the technical assistance we have already received from the Federal agencies in this connection and hope that Federal budgetary policy will permit these agencies to keep pace with our own effort.

In this connection, it might well be appropriate for the conference to record its recommendation that the Congress make available local assistance funds for the construction of waste treatment facilities at not less than the level authorized by the 89th Congress and that it augment the funds available for expedited mapping of flood plains in both Minnesota and Wisconsin.

Again, I would extend my best wishes for a successful culmination of your efforts.

Sincerely, signed Warren P. Knowles, Governor.

MR. STEIN: Thank you, Mr. Holmer.

Are there any questions or comments?

(No response.)

MR. STEIN: Again, I would like to express my appreciation for this statement.

Maybe I will join with the Senator. It is a fine thing to find that the States are criticizing us for not going fast enough or far enough, and we are delighted to have it.

Before we start the Federal presentation, we will recess for ten minutes.

(Whereupon a recess was had.)

MR. STEIN: May we reconvene?

While these are, of course, formal conferences, on the part of the enforcement action, we try to keep them as flexible as possible. You are beginning to see the shape of the procedure now.

What we are going to try to do is have the Federal presentation before lunch, and then recess for lunch. When we come back we will call on the States in the safest possible way, alphabetical order. Minnesota will be called on first. Minnesota will make a statement and will call on its participants, and then Wisconsin will make its statement. You can be sure that everyone who has something relevant to say will be given an opportunity to be heard.

At this point, I would like to call on Mr. H. W. Poston for the Federal presentation.

Mr. Poston.

STATEMENT OF H. W. POSTON, CONFEREE AND ACTING REGIONAL DIRECTOR, GREAT LAKES REGION, FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DEPARTMENT OF THE INTERIOR

MR. POSTON: Mr. Chairman, Fellow Conferees, Ladies and Gentlemen:

I have a five-page report here which I had intended to read to you this morning and tell you some of my optimism for feeling that we are going to clean up this pollution problem on the upper Mississippi River.

I think that Senator Nelson has quite eloquently laid out to you much of this problem. He has said, in more eloquent language and terms than I can ever say, all of the things that concern this particular problem on the upper Mississippi River. Then Chester Wilson came forth, and he also has elaborated on parts of this problem.

Really, my objective and the reason that I am here is to develop with these conferees an action program, and the sooner we can get at this action program, the sooner I am going to satisfy the objective and the reasons for my being here.

So I propose, Mr. Chairman, to enter in the record the statement that I have here, and to move along with the presentation of our Federal Report.

Mr. Albert Printz, Jr., has directed and carried on this investigation in the upper Mississippi River area with a competent staff here located at the Naval Air Station, and I would like to call on Mr. Printz to give to you what he has prepared here in this Federal Summary and Pollution Abatement Recommendations, and I will call on Mr. Printz at this time.

MR. STEIN: Thank you.

That statement of yours will be included as if read in the record, and I want to thank you for giving up your time. I know you certainly did a great deal of work.

Mr. Wilson, I would like to say that your statement was excellent. In this field, Mr. Wilson is, as you can tell, a veritable encyclopedia. I didn't know he was going to make that statement at the conference now, but it will persist.

MR. WISNIEWSKI: Mr. Chairman, does Mr. Poston's statement contain anything the conferees should know in order to draw up their conclusions?

MR. POSTON: I will have a copy prepared and submitted to you shortly.

MR. WISNIEWSKI: If it does, we would like copies for all of the conferees.

MR. POSTON: We will so do this.

MR. STEIN: Thank you.

(The following is the statement submitted by Mr. H. W. Poston:

It gives me great pleasure to be in the Twin Cities today for the second session of this conference. It hardly seems possible that three years have elapsed since the first session of the conference adjourned and a formal study was initiated. I am optimistic today, much more so than I was three years ago, that these waters can be cleaned up -- and kept clean. My optimism is based on three things that have happened in this three-year period: First, we have had momentous Federal and State legislation; on the Federal level the Water Quality Act of 1965 and the Clean Waters Restoration Act of 1966. Secondly, we have seen a marked change in public opinion and there is now overwhelming public sentiment in support of clean water. And, third, we have a report, and I say with justifiable pride, one which outlines an action program which, if implemented, will result in the clean water we all want -- and which the people of this area have a right to expect.

Let me elaborate briefly on each of these three points in order, starting with the new legislation. The requirement establishing water quality standards on interstate waters throughout the country was brought about by the Water Quality Act of 1965. This represents a major departure in water pollution control. As a matter of fact, it is the biggest thing going today not only in the field of water resources but in the whole field of environmental management and control.

In taking this unprecedented step the Congress said, in effect: Water pollution in this country has gone far enough. The time has come to call a halt. From here on there are going to be standards of quality for all the major lakes and streams of this country, and those standards are going to be enforced. This task is now at a crucial stage, and we in the Federal Water Pollution Control Administration are doing everything we can to help the States carry out the letter and spirit of the law. There is much at stake, and time is running out. The purpose of the Water Quality Standards provision is both preventive and curative. Reduced to fundamentals, the object is to preserve those waters that are still clean and to restore to acceptable levels of cleanliness those waters that have become polluted.

The enactment of the Clean Waters Restoration Act of 1966 marked the beginning of a new offensive in America's war on pollution. This landmark legislation makes it quite clear that the Federal Government is prepared to do more than it ever did before to win the battle for clean water. At the same time, the Federal law calls for a comparable all-out effort by the States, the local municipalities, and American industry. Although the solution to pollution is not merely opening the flood gates of the Federal Treasury, much greater Federal financial assistance is now available than ever before.

H. W. Poston

At the last session of the conference, we heard reference to the fact that the river could never be cleaned up because of the storm water overflow problems and that a solution to these problems was too expensive. The Minneapolis-St. Paul Sanitary District, as many of you know, was among the first in the United States to receive Federal funds under the Demonstration Grant provisions of the Act, aimed toward a solution to the overflow problem. The program which is now being pursued, using local funds as well as Federal, hopefully will go a long ways towards demonstrating the practical control of these overflows. The Amendments of 1966 also contain authorization for doubling the amounts of monies given to the State water pollution control agencies for furtherance of their programs. These program grants are to be utilized by the State agencies for the extension of their programs.

The new amendments also included new provisions relative to the section dealing with grants for construction of municipal waste treatment plants. The dollar limitation on the amount of Federal funds in the project will be removed on June 30, and the limitations then will be on a straight percentage basis of the total project cost. The new amendment authorizes appropriations of $450 million for next year and gradually increases the annual authorization to $1.25 billion by 1971.

Many of the midwestern States are now proceeding to amend their legislation in order that they might take greater advantage of the Federal money. It is now possible, with the State contributing a share of the cost of construction and the project being a part of an overall unified approach to the States' water pollution control plan, that local communities can get their treatment plants built or updated for a local expenditure of as little as 15 percent of the project cost. Some of the midwestern States which have or are considering modifying their legislation are Ohio, Indiana, Michigan, Illinois, and Wisconsin.

One other indication that the Federal Government means business and intends to do its share in the cleanup is the regulations governing tax credit for construction of industrial water pollution control facilities. Water pollution abatement works have been exempt from the suspension of the investment tax credit if certain conditions are satisfied. This means that under certain conditions, industries can deduct up to seven percent of the cost of new waste treatment plant construction from its income tax liability notwithstanding the general suspension of the investment tax credit. This is certainly an additional incentive for industries to move ahead now in the cleanup program. Already, some Minnesota firms have sought information concerning the procedures to be followed.

The second of the three significant changes, that of the change in public opinion, has simply been a general raising of the sights as to what can and should be done. People in this area have come to realize that something must be done now to protect and improve their precious heritage of clean water. I think it can be said that the people are now taking the lead in water pollution control. Public debate no longer centers on whether or not we can afford the cost of waste treatment; the question is now, "How soon can the job be done?" From the publicity I have seen concerning our report, I am convinced that the citizens and their leaders want action now to restore the quality of the waters of this area.

This brings me to the final point, that is, the study which was carried out by Federal personnel. This study has fulfilled the directives issued at the time of the last conference, which was to assess the pollution problem and to propose remedial action. The Minnesota Water Pollution Control Commission joined with the Federal

Government in the study of this area. Minnesota Health Department engineers participated in many activities -- from river and industrial waste surveys to joint studies of pathogenic bacteria and viruses.

The Federal study has added a great deal of specific information to that which was available three years ago. Foremost among these additions is the specific information obtained relative to the strength and quantity of waste coming from all sources. Through cooperative efforts with both the State of Minnesota and the MSSD (Minneapolis-St. Paul) a complete analysis of the District's waste was performed for the first time. The first tracing of pathogenic bacteria and enteric viruses was accomplished as a joint Federal-State venture. The rivers were also biologically characterized for the first time as was the evaluation of the tainting of fish flesh in the streams of the study area. The results of this activity have proven to be so useful that the techniques employed have been adopted at other Federal studies around the country. The same holds true for the simple, yet highly successful, methods employed in the first refined determination of the time of travel in the waters under study.

Many of the problems that existed three years ago still exist today, but many of the problems are on the way towards corrective action. Several cities and industries have already initiated actions recommended in our report. I feel that with the background information furnished by the study and the resultant recommendations, we have pointed the way toward the improvement of these waters for all legitimate uses. The Federal Water Pollution Control Administration is vitally interested in seeing that the waters of the entire Mississippi River basin along with other basins throughout the country are restored and protected for the future.

I believe that we conferees, meeting here today, have a priceless opportunity to map the grand strategy for victory in this war against water pollution in this area. We have been given the tactical weapons to do this. We have strengthened Federal and in many instances State legislation; we have enthusiastic public support; and we have, in this report, a recommended action program. That is why I said at the outset that I am optimistic that these waters can be cleaned up -- and kept clean!

MR. STEIN: Mr. Printz?

STATEMENT OF ALBERT C. PRINTZ, JR., SANITARY ENGINEER, FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DEPARTMENT OF THE INTERIOR

MR. PRINTZ: Thank you.

Mr. Chairman, Conferees, Ladies and Gentlemen:

For the record, I am Albert Printz, Sanitary Engineer with the Federal Water Pollution Control Administration.

In presenting the Federal recommendations of the conferees, I will abridge the booklet entitled "Summary and Pollution Abatement Recommendations for the Upper Mississippi River and Major Tributaries," and will frequently refer to various tables and figures therein. I therefore ask that the report contents be entered into the record in their entirety, beginning with the map preceding Page 1.

MR. STEIN: Do you want this included in the record?

MR. PRINTZ: Yes. Since I will frequently refer to various tables and figures in this report throughout the presentation, I would therefore ask that the contents of the report be entered into the record in their entirety, beginning with the map which precedes Page 1.

I should also like to include in the proceedings by reference only, rather than complete reproduction, a supplementary report of the Project entitled "A Report on Pollution of the Upper Mississippi River and Major Tributaries."

MR. STEIN: The report entitled "Summary and Pollution Abatement Recommendations for the Upper Mississippi River and Major Tributaries," without objection, will be included in the record as if read.

The other document will be included as an exhibit and will be on file at the Federal offices in Washington and in Chicago, and also the office in Minneapolis.

MR. HOLMER: Mr. Chairman, as a matter of information, the entering of this document in the record at this point, will it create any problems in the development of any possible amendments thereof in the course of the conference?

MR. STEIN: No. I think the sole purpose is to save time.

MR. HOLMER: All right.

MR. STEIN: Again, let me indicate what this document is, and what Mr. Printz' role is.

This is a document containing the findings and the recommendations of our investigators. It is not sacrosanct because it is printed rather than written or mimeographed. The purpose of entering it as if read would be to save time.

How long do you think it would take, about forty minutes?

MR. PRINTZ: Yes, sir.

MR. STEIN: This would take about an hour's worth of time. We could, if you wish, have him read the whole document, but the only effect the entry has is one of saving time.

MR. HOLMER: Thank you.

(The following is the report submitted by Mr. A. C. Printz, Jr.:

SUMMARY AND POLLUTION ABATEMENT RECOMMENDATIONS

FOR THE UPPER MISSISSIPPI RIVER AND MAJOR TRIBUTARIES

FEDERAL WATER POLLUTION CONTROL ADMIN.
TWIN CITIES-UPPER MISSISSIPPI RIVER PROJECT

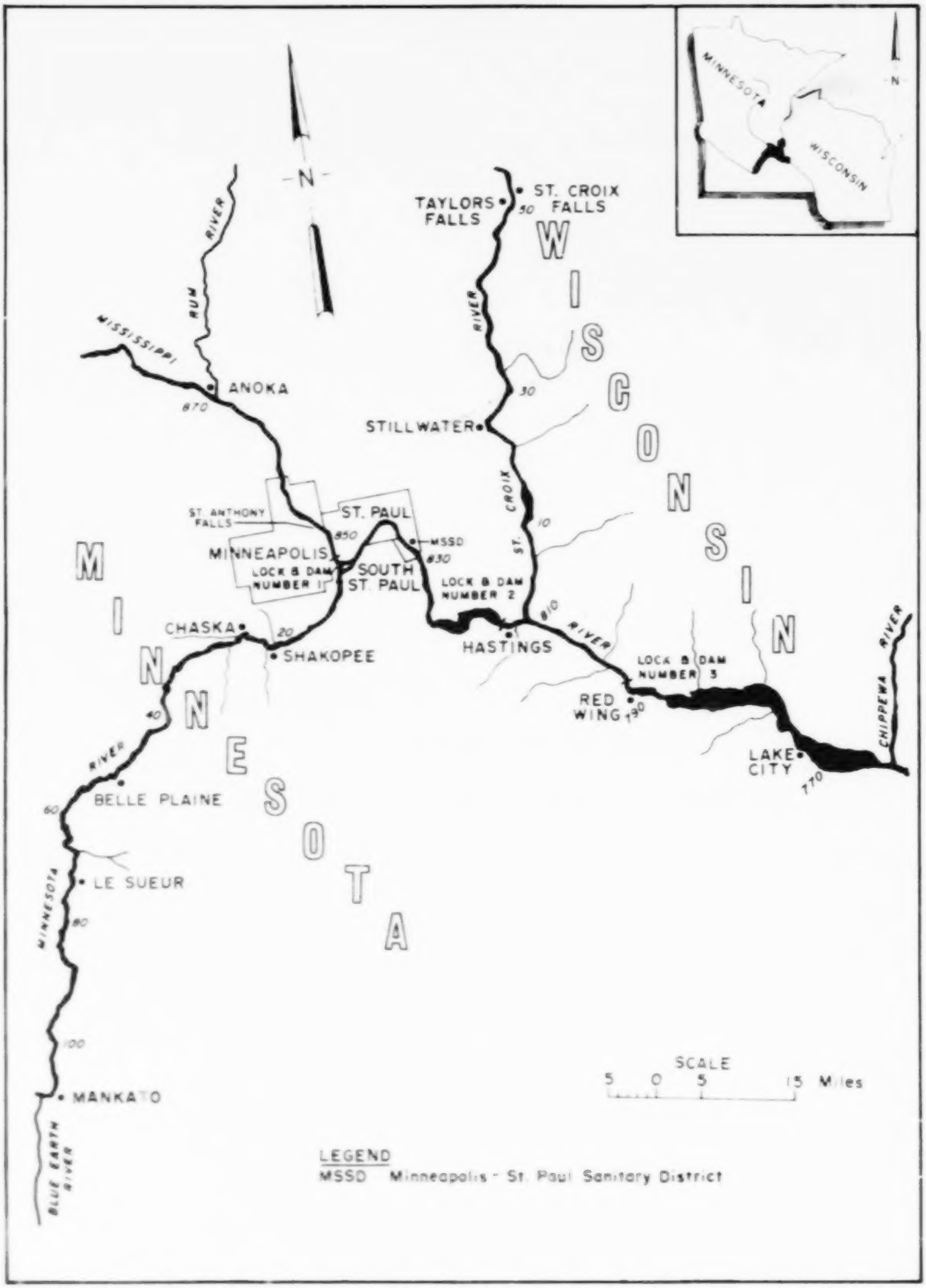

N
MINNESOTA
WISCONSIN
TAYLORS FALLS
ST. CROIX FALLS
ANOKA
STILLWATER
ST. ANTHONY FALLS
ST. PAUL
MINNEAPOLIS
MSSD
LOCK & DAM NUMBER 1
SOUTH ST. PAUL
LOCK & DAM NUMBER 2
HASTINGS
CHASKA
SHAKOPEE
LOCK & DAM NUMBER 3
RED WING
LAKE CITY
BELLE PLAINE
LE SUEUR
MANKATO
MISSISSIPPI
RUM RIVER
ST. CROIX RIVER
RIVER
MINNESOTA RIVER
BLUE EARTH RIVER
CHIPPEWA RIVER
870
850
830
810
790
770
50
30
10
20
40
60
80
100
SCALE
5 0 5 15 Miles
LEGEND
MSSD Minneapolis - St. Paul Sanitary District

FIGURE 1 - For the development of pollution abatement recommendations investigations were conducted on water quality, sources and quantities of wastes, and the extent of pollution in 270 miles of river.

A. C. PRINTZ, JR.

INTRODUCTION

The investigation of water pollution along the Upper Mississippi River and its major tributaries, a summary of which is presented herein, was conducted by the Twin Cities-Upper Mississippi River Project of the Federal Water Pollution Control Administration. The investigation was made under the authority of Section 10(d) (1) of the Federal Water Pollution Control Act as amended (33 U.S.C. 466 et seq.) and at the request of the conferees of the Federal-State conference on water pollution held in St. Paul, Minnesota on February 7 and 8, 1964. The Conference, in turn, was held in response to a joint request from the Governors of Minnesota and Wisconsin to abate pollution in the area and was called by the Secretary of the Department of Health, Education, and Welfare.

The investigation was conducted to gather information on water quality, sources and quantities of wastes, the extent of pollution, and necessary abatement measures in the following river reaches: Upper Mississippi River from the Rum River at Anoka, 107 miles downstream to the outlet of Lake Pepin; lower 110 miles of the Minnesota River; and the lower 52 miles of the St. Croix River (see Figure 1).

A. C. Printz, Jr.

Surveys of municipal and industrial waste sources were joint efforts of the Project, the appropriate State regulatory agencies, and in many instances the municipality or industry involved.

The summary of the 1st session of the Conference indicated that the investigations would be carried out in conjunction with both states and agencies. To this end, we are most appreciative of the cooperative attitude exhibited by all with whom the Project dealt. Participating agencies included the staffs of Minnesota's Department of Health and Department of Conservation; Wisconsin's Department of Resource Development and Department of Conservation; as well as many other federal, municipal and private organizations.

All desired information on waste sources and stream quality, collected over the years by the Minnesota Department of Health, Wisconsin Department of Health, and the Minneapolis-St. Paul Sanitary District Sewage Treatment Plant (MSSD) was made available to the project by these agencies.

Laboratory procedures were performed in accordance with "Standard Methods for the Examination of Water and Wastewater, Eleventh Edition." Any deviations were based on proven research described in the literature. All calculations (except those on flow frequencies) were based on data collected during the survey period (June 1964 - October 1965) and reflect conditions resulting from waste loadings being discharged during that period.

The main body of this report contains a more detailed description and discussion of all Project findings along with appropriate maps, figures and tables. The information provided in the Summary and Conclusions which follow, is a condensation of all the information contained in the main body of this report.

SUMMARY OF
WATER USES

Water uses in practice along the Mississippi, Minnesota and St. Croix Rivers are summarized below and illustrated in Figures 2 through 7.

POTABLE WATER SUPPLY

Minneapolis and St. Paul use the Mississippi System as a source of potable water supply for themselves and many of the suburbs. Other communities depend on ground water sources. The water intakes for Minneapolis and St. Paul, located just upstream from Minneapolis, withdraw an average of 103 million gallons per day (mgd) and serve approximately 873,000 people.

NONPOTABLE INDUSTRIAL PROCESS WATER

Significant amounts of untreated water from the Mississippi and Minnesota Rivers are used by four industries in their processes at seven locations within the study area. No use is made of the St. Croix River for this purpose.

On the Mississippi River, barge and gravel washing is carried out at two locations, each. Both activities are of a seasonal nature, operating from April through October. Barge washing, conducted near downtown St. Paul (river miles 840.4 and 837.3), requires about 2 million gallons per operating season. Gravel washing is performed about 6 miles farther downstream (river miles 826.5 and 825.0) and requires 650 million gallons of water per operating season.

On the Minnesota River, sugar beet washing and fluming is conducted during the winter (4-month period) near Chaska. Barge washing is conducted at two locations (river miles 13.2 and 8.0) between April and November of each year. The former operation requires about 700 million gallons per season and the latter ones require about 800 thousand gallons per season.

COOLING WATER

One processing industry and five steam-generating plants utilize Mississippi and Minnesota River waters for cooling purposes. No use is presently being made of the St. Croix River for this purpose.

The Mississippi River serves the one processing industry located at South St. Paul and three of the steam-electric generating plants, located in Minneapolis, St. Paul, and Red Wing. Together, they use cooling water at a maximum rate of 1,100 mgd.

The Minnesota River serves two of the steam-electric generating plants, located near Mankato and Bloomington. They use cooling water at a maximum rate of 405 mgd.

HYDROELECTRIC POWER

There are five hydroelectric plants within the study area and all utilize the Mississippi River. One is located 10 miles above Minneapolis and the other four are located in Minneapolis at St. Anthony Falls and Lock & Dam No. 1.

The total capacity of these plants is 42,260

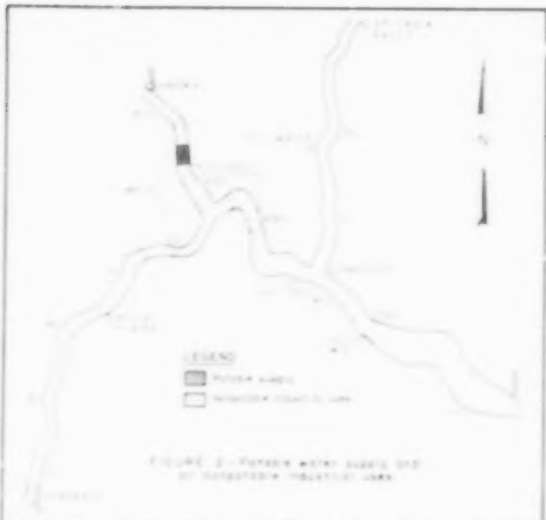

LEGEND
▨ Potable supply
☐ Nonpotable industrial uses
N

FIGURE 2 - Potable water supply and all nonpotable industrial uses

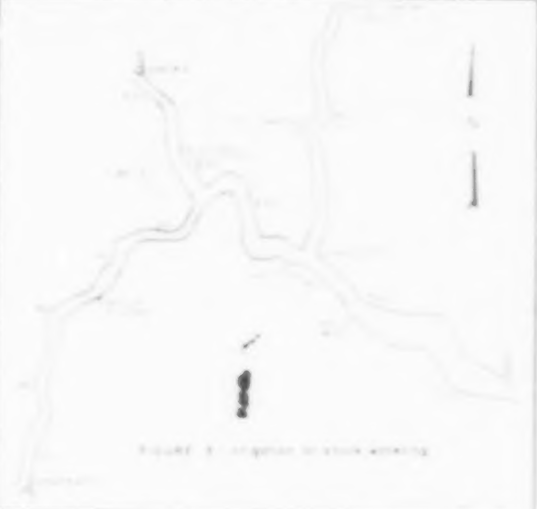


FIGURE 3 - Irrigation or stock watering

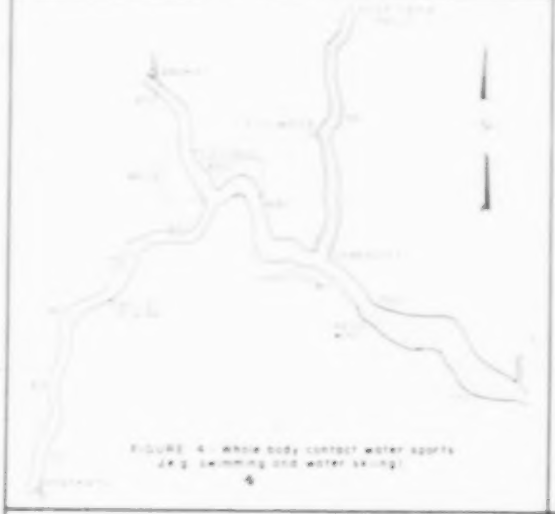


FIGURE 4 - Whole body contact water sports (e.g. swimming and water skiing)

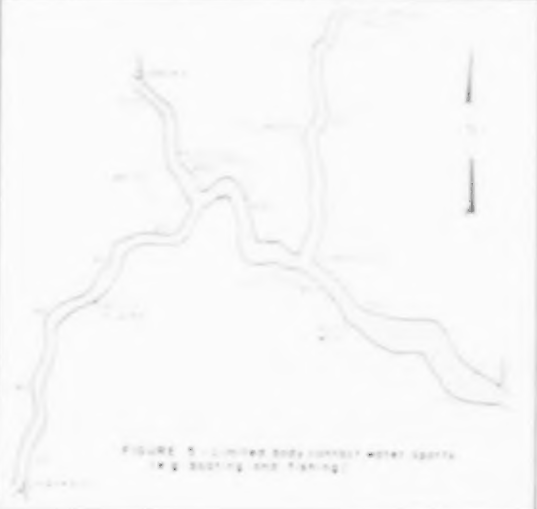


FIGURE 5 - Limited body contact water sports (e.g. boating and fishing)

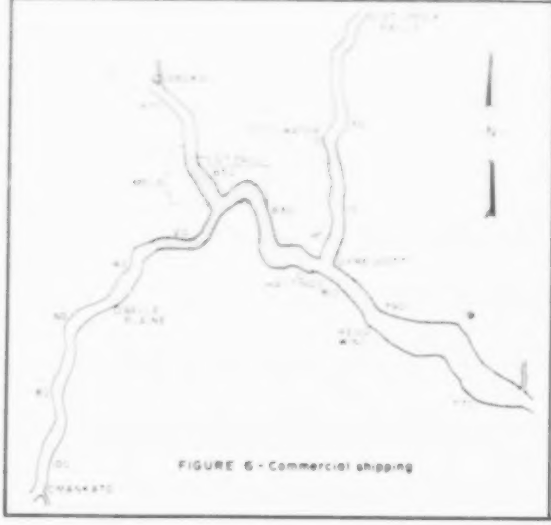


FIGURE 6 - Commercial shipping

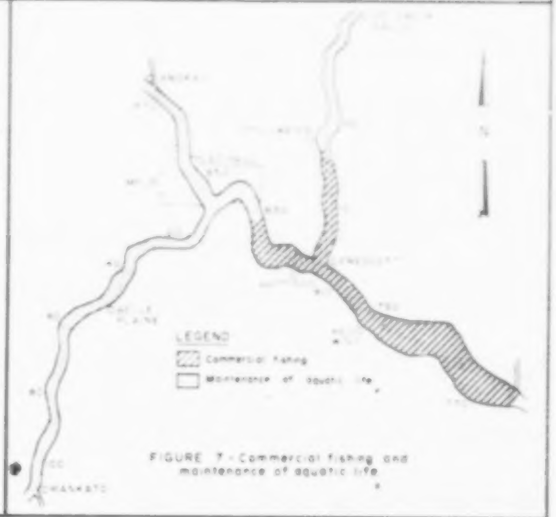

N
LEGEND
▨ Commercial fishing
☐ Maintenance of aquatic life
MANKATO

FIGURE 7 - Commercial fishing and maintenance of aquatic life

LEGEND ☐ Designates where each use is practiced extensively.

FIGURES 2-7. SUMMARY OF WATER USES.

KW, 3.2 percent of the total steam-electric power plant capacity in the study area.

IRRIGATION AND STOCKWATERING

Very little use is made of the Mississippi River system for irrigation and stockwatering.

Permits for withdrawal of irrigation water have been issued to persons along the Mississippi River above Minneapolis and near North Lake in Pool No. 3; along the Minnesota River at Jordan; and along the St. Croix River just above Prescott. There may also be some use for irrigation by truck farmers along the north bank of the Mississippi River just above Lock & Dam No. 2 and along the lower 35 miles of the Minnesota River.

Very limited use is made of the rivers for stockwatering. Small numbers of cattle have been seen drinking from the Mississippi River just above Lock & Dam No. 2 and from the Minnesota River above Chaska.

COMMERCIAL SHIPPING

Although river traffic in the Twin Cities area is significant, it is less than on the remainder of the

Mississippi River. During 1964 over five and one-half million tons of materials were received and shipped at the ports of Minneapolis and St. Paul. In this same year there were 1,556 commercial lockages made through Lock & Dam No. 2. Docking facilities extend upstream as far as the northern city limit of Minneapolis where the nine-foot channel ends.

The shipping channel extends upstream on the Minnesota River as far as Shakopee (river mile 25.1). During 1963 over two and one-quarter million tons of materials were received and shipped along this reach.

Commercial shipping extends upstream on the St. Croix River as far as Stillwater (river mile 23.3). In comparison to the Mississippi and Minnesota Rivers, barge traffic on the St. Croix River is very light.

Receipts consist generally of only two products, coal and superphosphate. Of the 30,567 tons of materials received in 1964, 17,939 tons were coal. Coal receipts are expected to increase significantly after the Allen S. King Power Plant becomes operational.

COMMERCIAL FISHING

Commercial fishing is practiced on the Mississippi River in and below Pool No. 2 and on the lower 23 miles of the St. Croix River, known as Lake St. Croix. The major source of fish in this area, however, has always been Lake Pepin in Pool No. 4. Fish caught commercially in Pools 3 and 4 during 1964 were valued at $91,320. No figures were available for catches in Pool No. 2 that year. The 1964 catch in Lake St. Croix totaled 511,586 pounds and was valued at $15,750. The predominant species of fish caught commercially are carp, buffalo, catfish and drum.

SWIMMING AND WATER SKIING

Swimming is practiced throughout the reach below Red Wing (Lake Pepin) and the lower St. Croix River from beaches as well as boats. There are eight beaches along Lake Pepin and seven beaches on the St. Croix River, however, which receive heaviest use. Approximately 650 people can normally be found along each of the two rivers using these beaches on a typical warm, sunny weekend day.

Water skiing is generally practiced in four areas, two on the Mississippi River and two on the St. Croix River. On the Mississippi River it is practiced near Anoka at the upper end of the study area and near Red Wing at the lower end. As many as 75 people make use of these areas on good days. Limited skiing is also practiced near St. Paul

Park, seven miles below MSSD. The two areas on the St. Croix River receiving heaviest use by water skiers are near Hudson (river mile 17.0) and Afton (river mile 11.0). Approximately 150 people make use of these areas on good days.

PLEASURE BOATING

Pleasure boating is practiced from April to September through out all three of the major streams under consideration. Greatest use, however, is made of the St. Croix River below Stillwater, and the Mississippi River below Lock and Dam No. 2.

SPORT FISHING

Fishing is an important summer, as well as winter, recreational activity in the area under consideration. The St. Croix River and the Mississippi River below its confluence with the St. Croix receive the greatest use although fishing is practiced to some extent over the entire area.

ESTHETIC ENJOYMENT

The scenic beauty afforded by the streams in this area has resulted in the location of about 30 parks along their banks. The two parks receiving greatest use are the Interstate and O'Brien State Parks, both located on the St. Croix River. The former is located on both sides of the river near Taylors Falls and St. Croix Falls. The latter is situated on the Minnesota shore midway between Taylors Falls and Stillwater. A large river oriented park is proposed for the area adjacent to the mouth of the Minnesota River.

In addition, there are many scenic highways that border on the streams under consideration. Plans are being developed to construct a national parkway following the course of the Mississippi River on both sides from Canada to the Gulf of Mexico.

MAINTENANCE OF HABITAT FOR AQUATIC LIFE AND WATERFOWL

Fish can be found throughout the streams in the study area in varying numbers and species. Ducks, white egrets, and herons can also be found along many reaches of the three rivers. The Mississippi River serves as a major artery in the continental system of flyways serving wildfowl migrations. Pools 2, 3 and 4 are spring and fall concentration areas for several species of duck. As many as 10,000 ducks at a time have been seen in the Spring Lake area (immediately above Lock & Dam No. 2).

WASTE DISPOSAL

Fifty-nine significant waste water producers utilize the major streams within the study area for disposal purposes. Their discharges total 1,800 (mgd). The steam-electric generating plants contribute 85 percent of this amount. Municipalities and other industries contribute 12 and 3 percent, respectively. In addition to the above contributors there are more than 100 combined and storm sewer outfalls which discharge during and immediately after rains. Approximately 80 of these are located in Minneapolis and St. Paul.

SUMMARY OF WASTE SOURCES

GENERAL

Sewage and other wastes contain many constituents which affect water quality in different manners and restrict the water's use. Floating materials such as grease, oils and solids lower the esthetic quality of a body of water, making it less attractive for all uses. Oxygen consuming materials (measured by 5-day (20°C) BOD) can limit or destroy fish, fish food organisms, and other desirable aquatic life by reducing the dissolved oxygen concentration in the water. Complete depletion of dissolved oxygen results in the generation of offensive odors. Suspended solids, including silt from land erosion, create turbidity which not only makes the water less suitable as a source of supply and for recreational uses, but can also be damaging to fish. Larger suspended solids eventually settle out, forming a sludge blanket on the bottom. This sludge blanket smothers fish food organisms and may affect navigation. Nitrogen, phosphorus, and heat promote the growth of algae (simple plants, many microscopic in size) which, in turn, create nuisance conditions affecting water supplies, recreational uses, and esthetic quality. Excessive ammonia nitrogen concentrations affect fish life. Some chemicals, such as phenols, impart undesirable tastes and odors to the water and the flesh of fish. Some of the intestinal bacteria, present in sewage in astronomical numbers, may be pathogens which can reinfect man.

The location of all waste sources investigated are shown in Figure 8. The most significant sources and the amounts of materials discharged by them are depicted in Figures 9, 10, and 11.

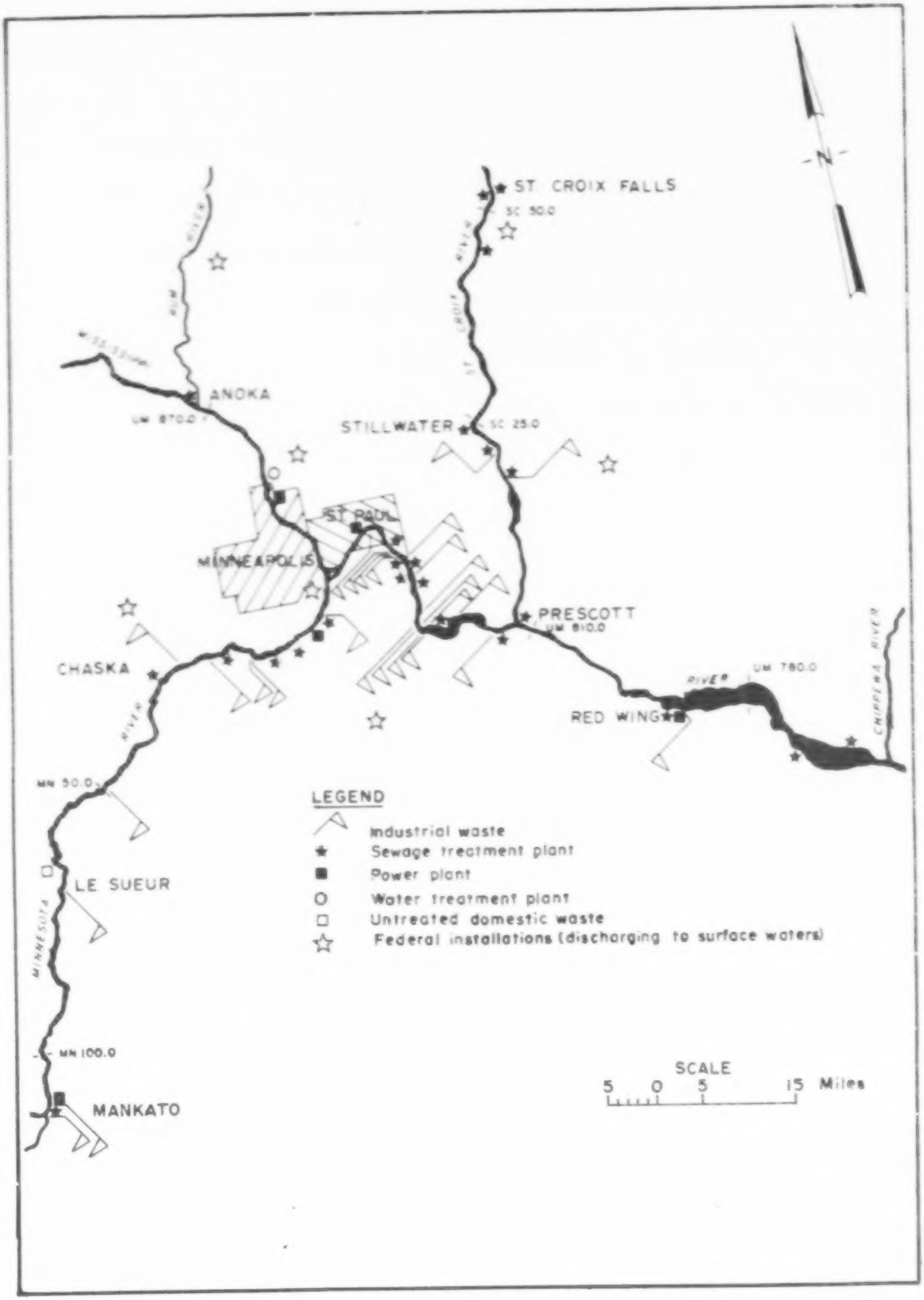
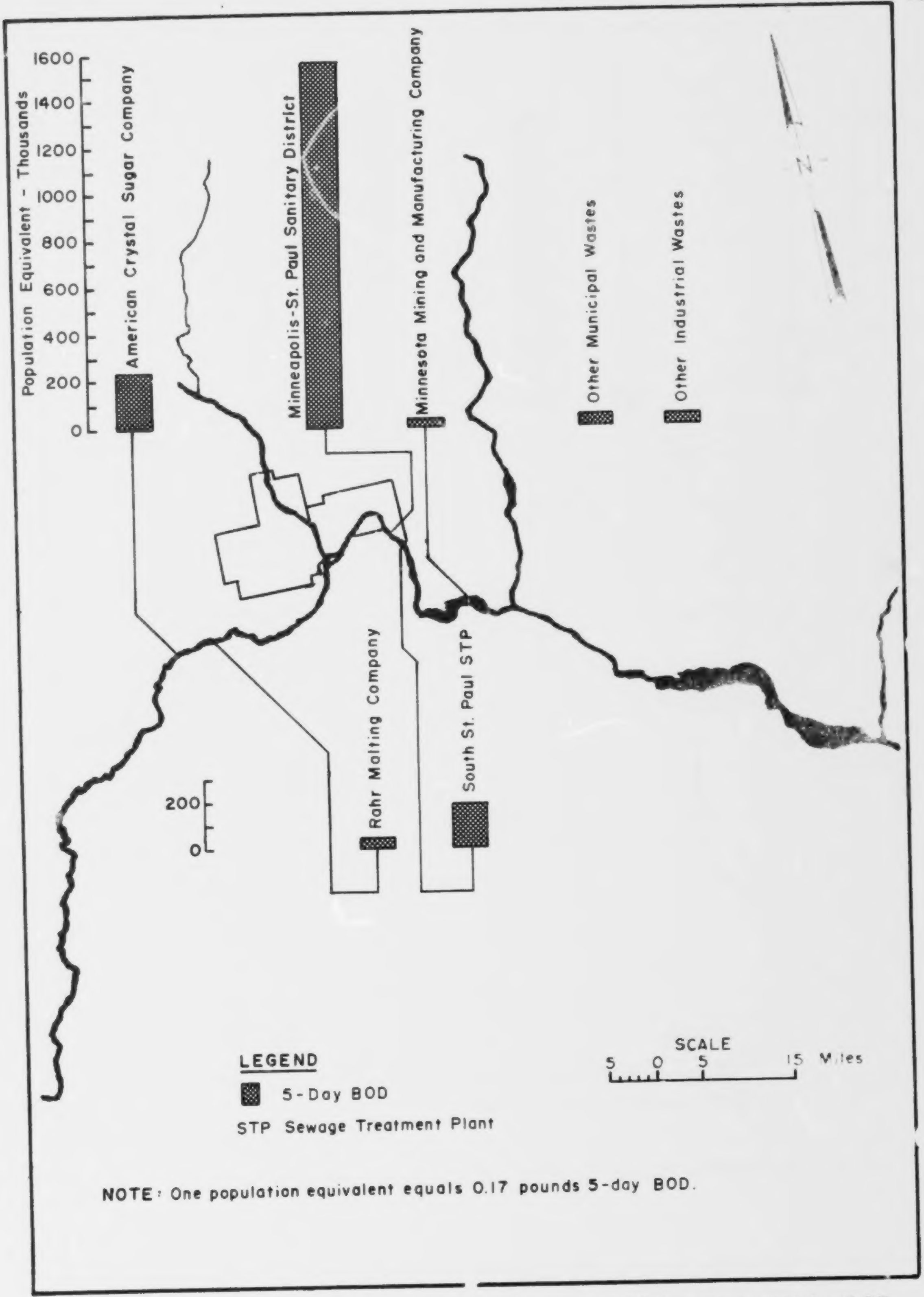

N
ST CROIX FALLS
SC 50.0
ST. CROIX RIVER
RUM RIVER
MISSISSIPPI
ANOKA
UM 870.0
STILLWATER
SC 25.0
ST PAUL
MINNEAPOLIS
PRESCOTT
UM 810.0
CHASKA
RIVER
RED WING
UM 780.0
CHIPPEWA RIVER
MN 50.0
LE SUEUR
MINNESOTA
MN 100.0
MANKATO
LEGEND
Industrial waste
Sewage treatment plant
Power plant
Water treatment plant
Untreated domestic waste
Federal installations (discharging to surface waters)
SCALE
5 0 5 15 Miles

FIGURE 8 - Location of waste sources investigated


Population Equivalent - Thousands
1600
1400
1200
1000
800
600
400
200
0
American Crystal Sugar Company
Minneapolis-St. Paul Sanitary District
Minnesota Mining and Manufacturing Company
Other Municipal Wastes
Other Industrial Wastes
Rahr Malting Company
South St. Paul STP
200
0
N
LEGEND
▨ 5-Day BOD
STP Sewage Treatment Plant
SCALE
5 0 5 15 Miles

NOTE: One population equivalent equals 0.17 pounds 5-day BOD.

FIGURE 9-Most significant contributors of BOD during 1964-1965.

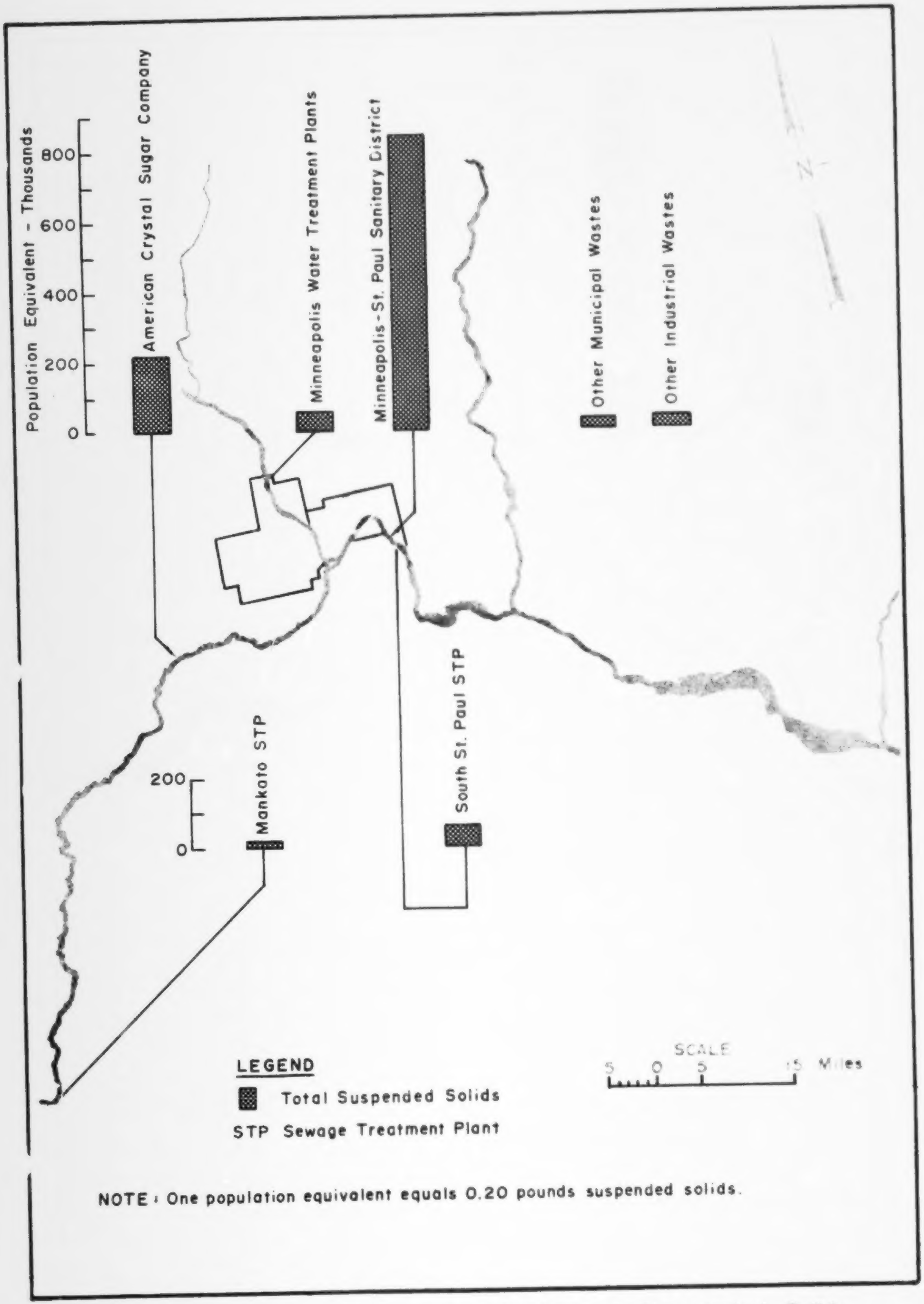
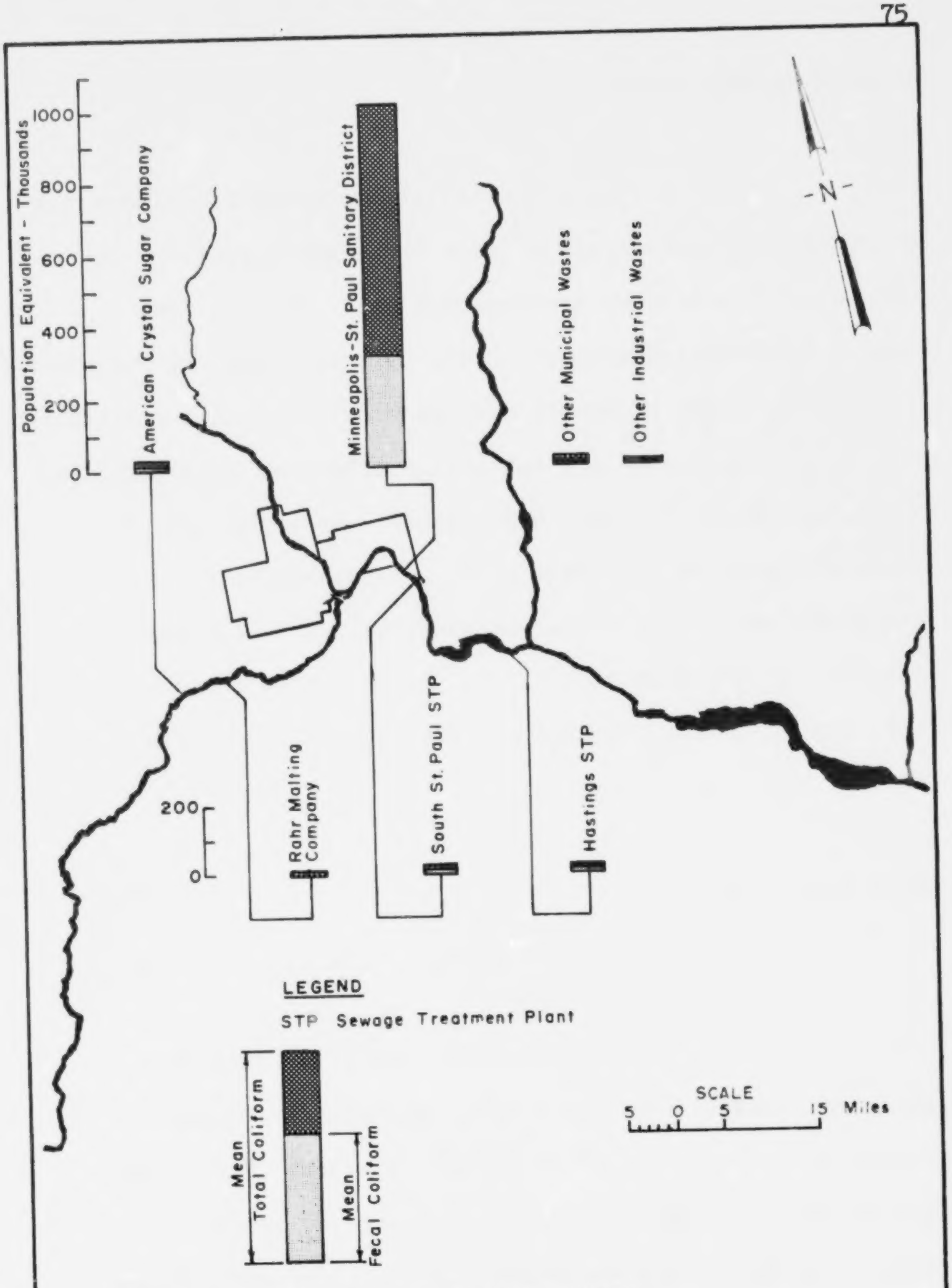

Population Equivalent - Thousands
0
200
400
600
800
American Crystal Sugar Company
Minneapolis Water Treatment Plants
Minneapolis-St. Paul Sanitary District
Other Municipal Wastes
Other Industrial Wastes
N
South St. Paul STP
Mankato STP
200
0
LEGEND
▨ Total Suspended Solids
STP Sewage Treatment Plant
SCALE
5 0 5 15 Miles
NOTE: One population equivalent equals 0.20 pounds suspended solids.

FIGURE 10 - Most significant contributors of Suspended Solids during 1964-1965.


Population Equivalent - Thousands
0
200
400
600
800
1000
American Crystal Sugar Company
Minneapolis-St. Paul Sanitary District
Other Municipal Wastes
Other Industrial Wastes
N
200
0
Rahr Malting Company
South St. Paul STP
Hastings STP
LEGEND
STP Sewage Treatment Plant
Mean Total Coliform
Mean Fecal Coliform
SCALE
5 0 5 15 Miles

NOTE: One population equivalent equals 1 X 10^{11} coliforms.

FIGURE 11 – Most significant contributors of Coliform Bacteria during 1964-1965

FEDERAL INSTALLATIONS

Twelve Federal installations within the Project's study area watershed handle their own waste disposal. Others discharge to municipal sewerage systems. Table 1 (see Appendix) gives information on the type of treatment and place of final disposal of wastes from each of these 12 installations.

None have any measurable effect on water quality in the portions of rivers under study. One, however, the 934th Troop Group Officers' Club, has unsatisfactory waste treatment facilities which discharge effluent to a marsh area adjacent to the Minnesota River. These wastes present a potential health hazard to water users along the lower Minnesota River.

MUNICIPAL SOURCES

MISSISSIPPI RIVER

There were five primary and seven secondary municipal sewage treatment plants discharging 208 mgd of wastes to the Mississippi River investigated. The primary plants are those operated by MSSD, Hastings, Prescott, Lake City, and Pepin. The secondary plants are those operated by Anoka, South St. Paul, Newport, Inver Grove, St. Paul Park, Cottage Grove, and Red Wing.

At the time of the survey these sources contributed the following loadings of constituents:

1. Oxygen-consuming wastes equivalent to raw sewage from a population of 1,800,000.
2. Coliform bacteria equivalent to raw sewage from a population of 1,200,000.
3. Suspended solids equivalent to raw sewage from a population of 920,000.
4. Approximately 42,000 pounds of organic and ammonia nitrogen compounds per day.
5. Approximately 24,000 pounds of phosphates per day.
6. Approximately 850 pounds of phenols per day.

The MSSD is the largest plant and contributes 91 percent of the municipal wastes volume. Of the total municipal contribution, MSSD's waste effluent contained 88 percent of the oxygen consuming materials; 95 percent of the coliforms; 92 percent of the suspended solids; 85 percent of the organic nitrogen, ammonia nitrogen, and phosphates; and essentially 100 percent of the phenols.

The South St. Paul sewage treatment plant (SSP) is the second largest one and contributes 7 percent of the municipal wastes volume. Of the total municipal contribution, this source discharged 11 percent of the oxygen consuming materials, 2 percent of the coliforms, 6 percent of the suspended solids, 12 percent of the organic and ammonia nitrogen, and 9 percent of the phosphates.

The other 10 plants contributed the remaining 2 percent of the municipal wastes volume and from 1 to 6 percent of the various constituents discussed above.

Table 2 (see Appendix) summarizes the information obtained on the characteristics of wastes from all municipal sewage treatment plants investigated. Loading rates of the various constituents discharged from each plant to the river are summarized in Table 3 (see Appendix).

MINNESOTA RIVER

There were seven communities and a Masonic home discharging to the Minnesota River within the study area. Two of the communities (Mankato and Shakopee) and the Masonic home provide primary treatment. Only one, the City of Henderson, is without any treatment facilities. The remaining four communities (Chaska, Savage, Burnsville, and Cedar Grove) provide secondary treatment. At the time of the survey, these sources contributed the following loadings of constituents:

A. C. Printz, Jr.

1. Oxygen consuming wastes equivalent to raw sewage from a population of 24,600.
2. Coliform bacteria equivalent to raw sewage from a population of 12,500.
3. Suspended solids equivalent to raw sewage from a population of 19,300.
4. Approximately 850 pounds of organic and ammonia nitrogen per day.
5. Approximately 550 pounds of phosphates per day.

The Mankato sewage treatment plant is the largest one on the Minnesota River and contributes 4.5 mgd, about 74 percent of the total municipal wastes volume. Of the total municipal contribution, Mankato's waste effluent contained 85 percent of the oxygen consuming materials; 54 percent of the coliforms; 69 percent of the suspended solids; 69 percent of the nitrogenous compounds; and 49 percent of the phosphates.

The second largest municipal contributor of oxygen consuming wastes and coliforms was Shakopee, which contributed 7 and 24 percent of the totals, respectively. The remaining plants discharge much smaller quantities of wastes. Additional information on municipal waste characteristics and stream loading rates from these plants is summarized in Tables 2 and 3.

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ST. CROIX RIVER

Six communities discharge wastes to the St. Croix River within the study area. Two (Osceola and Stillwater) provide primary treatment and the remainder (St. Croix Falls, Taylor Falls, Bayport, and Hudson) provide secondary treatment. At the time of the survey, these sources contributed the following loadings of constituents:

1. Oxygen consuming wastes equivalent to raw sewage from a population of 9400.
2. Coliform bacteria equivalent to raw sewage from a population of 1,600.
3. Suspended solids equivalent to raw sewage from a population of 7000.
4. Approximately 400 pounds of organic and ammonia nitrogen per day.
5. Approximately 500 pounds of phosphates per day.

The Stillwater, Minnesota primary sewage treatment plant is the largest single contributor on the St. Croix River. It discharges 1.8 mgd, about 58 percent of the total municipal wastes volume. Of the municipal contribution, Stillwater's waste effluent contained 78 percent of the oxygen consuming materials; 54 percent of the coliforms; 75 percent of the suspended solids; 57 percent of the nitrogenous compounds; and 54 percent of the phosphates.

The remaining five plants are much smaller in capacity, receiving less than 0.6 mgd each. Additional information on municipal waste characteristics and stream loading rates from these plants is summarized in Tables 2 and 3.

INDUSTRIAL SOURCES

MISSISSIPPI RIVER

Fourteen manufacturing and processing plants, two water treatment plants, three steam-electric generating plants, and two barge washing facilities were investigated on the Mississippi River. The fourteen manufacturing and processing plants referred to are Swift & Co., Union Stockyards, Armour & Company, King Packing Co., Northwestern Refining Co., J. L. Shiely Co., General Dynamics Liquid Carbonics Division, St. Paul Ammonia Products Co., Great Northern Oil Co., Northwest Cooperative Mills, Minnesota Mining and Manufacturing Co., H. D. Hudson Manufacturing Co., Foot Tanning Co., and Pittsburgh Plate Glass Co. The two water treatment plants investigated are owned and operated by the City of Minneapolis.

The barge washing facilities investigated were those of the Minnesota Harbor Service and Twin City Shipyard. These industrial sources, excluding the three electric plants, discharge wastes at the rate of about 35 mgd to the river. The steam-electric plants utilize as much as 1,095 mgd of river water for cooling purposes, returning it directly to river after use. These sources, together contributed the following loadings of constituents:

1. Oxygen consuming wastes equivalent to raw sewage from a population of 35,000.
2. Coliform bacteria equivalent to raw sewage from a population of 170.
3. Suspended solids equivalent to raw sewage from a population of 70,000.
4. Approximately 4,500 pounds of organic and ammonia nitrogen compounds per day.
5. Approximately 2,500 pounds of phosphates per day.
6. Approximately 40 pounds of phenols per day.
7. Approximately 600 pounds of fluoride per day.
8. Approximately 160 billion British Thermal Units (BTU) of heat per day (when steam-electric plants are operating at full capacity).

Table 4 (see Appendix) summarizes the information obtained on the characteristics of wastes from all industries investigated. Loading rates of the various constituents discharged to the river are summarized in Table 5 (see Appendix).

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MINNESOTA RIVER

Eleven manufacturing and processing plants, two steam-electric generating plants, and two barge cleaning facilities were investigated on the Minnesota River. The eleven manufacturing and processing plants investigated were the North Star Concrete Co., Archer Daniels Midland Co., Blue Cross Rendering Co., Green Giant Co., Minnesota Valley Milk Processing Assoc., American Crystal Sugar Co., M. A. Gedney Co., Rahr Malting Co., Owens-Illinois Glass Co., American Wheaton Glass Co., and Cargill, Inc. The two steam-electric generating plants (Wilmarth and Blackdog) referred to are owned and operated by the Northern States Power Company. The two barge washing facilities are those of Twin City Shipyards. One industry, Honeymead Products Co., located on the Blue Earth River near its confluence with the Minnesota River, was also investigated. These industries, excluding the two electric plants, discharge wastes at the rate of 18 mgd to the river. The steam-electric plants utilize as much as 405 mgd of river water for cooling purposes, returning it to the river after use. The Blackdog electric plant passes the water through a cooling pond before returning it to the river. At the time of the survey, these sources, together, contributed the following loadings of constituents:

1. Oxygen consuming wastes equivalent to

raw sewage from a population of 273,000.

2. Coliform bacteria equivalent to raw sewage from a population of 40,300.
3. Suspended solids equivalent to raw sewage from a population of 238,000.
4. Approximately 1,200 pounds of organic and ammonia nitrogen per day.
5. Approximately 950 pounds of phosphates per day.
6. Approximately 740 pounds of oil and grease per day.
7. Approximately 60 billion BTU of heat per day (when steam-electric plants are operating at full capacity and discharging cooling water directly to river.)

Additional information on industrial waste characteristics and stream loading rates is summarized in Tables 4 and 5.

ST. CROIX RIVER

There are two industries (Andersen Window Co. and United Refrigerator Co.) on the St. Croix River. Together they discharge wastes at the rate of 0.5 mgd. These sources contributed the following loadings of constituents:

1. Oxygen consuming wastes equivalent to raw sewage from a population of 330.

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2. Suspended solids equivalent to raw sewage from a population of 300.
3. Approximately 3 pounds of organic and ammonia nitrogen per day.
4. Approximately 5 pounds of phosphates per day.
5. Less than one pound of chromium per day.

Additional information on industrial waste characteristics and stream loading rates is summarized in Tables 4 and 5.

COMBINED SEWER OVERFLOWS

The cities of Minneapolis, St. Paul, and South St. Paul each have combined sewers with regulators that divert excess flows directly to the Mississippi River.

The Minneapolis-St. Paul combined sewer system has more than 80 overflow points. It is estimated that over a period of one year, up to 3.5 percent of sewage reaching the MSSD treatment plant may be lost without treatment. The total of these figures represent about 7.5 million pounds of 5-Day (20°C) BOD and 9.5 million pounds of suspended solids on a yearly basis. This overflow occurs over about 10 percent of the time in a given year.

The South St. Paul combined sewer system is very similar in design to that of the Twin Cities. South St. Paul has a more serious surcharging problem along a considerable portion of the interceptor, however, during periods of maximum dry-weather flow. In general, the interceptor has only about one-half the required capacity to handle the maximum dry-weather flow plus the runoff from a rainfall intensity of 0.04 inches per hour. It is estimated that South St. Paul's overflow system contributes about 6 million pounds of 5-Day (20°C) BOD and 5 million pounds of suspended solids on a yearly basis.

AGRICULTURAL AND NATURAL POLLUTION

Nutrients are the primary products of concern resulting from agricultural activities and the natural death and decay of plant and animal life. Among the nutrients, nitrogen and phosphorus are considered the most important. At times, suspended solids, resulting from erosion, are also of concern.

MISSISSIPPI RIVER

Approximately 40,000 and 20,000 pounds per day of total nitrogen and phosphate (as PO_4) respectively, would be expected to enter the Mississippi River above Lake Pepin from agricultural and natural sources at the mean August flow (9,480 cfs at St. Paul).

MINNESOTA RIVER

Approximately 6,000 and 4,000 pounds per day of total nitrogen and phosphate (as PO_4) respectively, would be expected to enter the study area via the Minnesota and Blue Earth Rivers from agricultural and natural sources at the mean August flow (2,677 cfs at Carver).

Turbidity, occurring naturally, is considerably more than 25 units in waters entering the study area at Mankato except on occasions of low stream flows after long absences of surface runoff. The sand-silt-clay mantle, through which the river flows is largely responsible for this condition. Land erosion within the drainage basin also contributes to this problem.

ST. CROIX RIVER

Approximately 13,000 and 2,000 pounds per day of total nitrogen and phosphate (as PO_4) respectively, would be expected to enter the study area via the St. Croix River from agricultural and natural sources at the mean August flow (3,580 cfs at Stillwater).

SUMMARY OF WATER QUALITY
AND
INTERFERENCE WITH WATER USES

GENERAL

Ideally, a stream should be high in dissolved oxygen, low in temperature, turbidity, nitrogen, phosphate, phenol and bacteria.

A dissolved oxygen concentration of at least three mg/l is required in order to maintain a suitable habitat for rough fish. A minimum of five mg/l is required for game fish.

Water temperatures should not exceed 93°F in order to maintain a suitable habitat for rough fish and to be suitable for limited body contact activities (e.g. boating and commercial shipping.) The maximum temperature permitted for whole body contact activities (e.g. swimming and water skiing) and for irrigational or cooling water use is 90°F. To be suitable as a source of potable supply and as a habitat for game fish, the water temperature should not exceed 86°F.

Waters used as a source for potable supplies and for whole body contact activities, such as swimming and water skiing, should have a turbidity of not greater than 25 jackson units. Most other water uses require a turbidity of less than 250 jackson units.

Nitrogen in the ammonia form should not exceed 1.0 mg/1 for game fish and 2.0 mg/1 for rough fish. Inorganic nitrogen and phosphorus in concentrations greater than 0.3 mg/1 (as nitrogen) and 0.03 (as phosphate) at the time of spring overturn are generally considered sufficient to produce algal blooms in lakes. (Pools behind locks and dams become lakes at low-stream flows.)

Phenolic compounds in concentrations greater than 0.001 mg/1 produce undesirable tastes and odors in chlorinated drinking water supplies. In concentrations greater than 0.01 mg/1 they taint fish flesh.

Sewage polluted waters frequently contain pathogenic bacteria which, if ingested, can cause gastrointestinal diseases such as typhoid fever, dysentery, and diarrhea. Body contact with sewage-polluted waters can cause eye, ear, nose, throat or skin infections. Viruses, which cause diseases, including polio, hepatitis, and meningitis, may also be present.

Sewage also contains readily detectable coliform bacteria which typically occur in the feces of man and other warm-blooded animals. Not all coliform bacteria are of intestinal origin, however. Though generally harmless in themselves, coliform bacteria are always present in sewage-polluted waters and have, therefore, been considered indicators of the probable presence of pathogenic bacteria.

Many water pollution control agencies evaluate water quality on the basis of total coliform count, which includes those of intestinal as well as non-intestinal origin. In this report a total coliform density of greater than 5,000/100 ml is considered to be unsafe for any water use involving limited body contact (e.g. boating, commercial shipping, and fishing) or for irrigation and stock and wildlife watering. Waters used as a source of potable water supply should not have a total coliform density greater than 4,000/100 ml. The total coliform density in waters used for whole body contact activities (e.g. swimming and water skiing) should not exceed 1,000/100 ml.

In this study a more selective test was used to identify fecal coliform bacteria, in addition to the total coliform. This permitted a better evaluation of the significance of total coliform counts since the presence of fecal coliform bacteria is positive proof of fecal contamination.

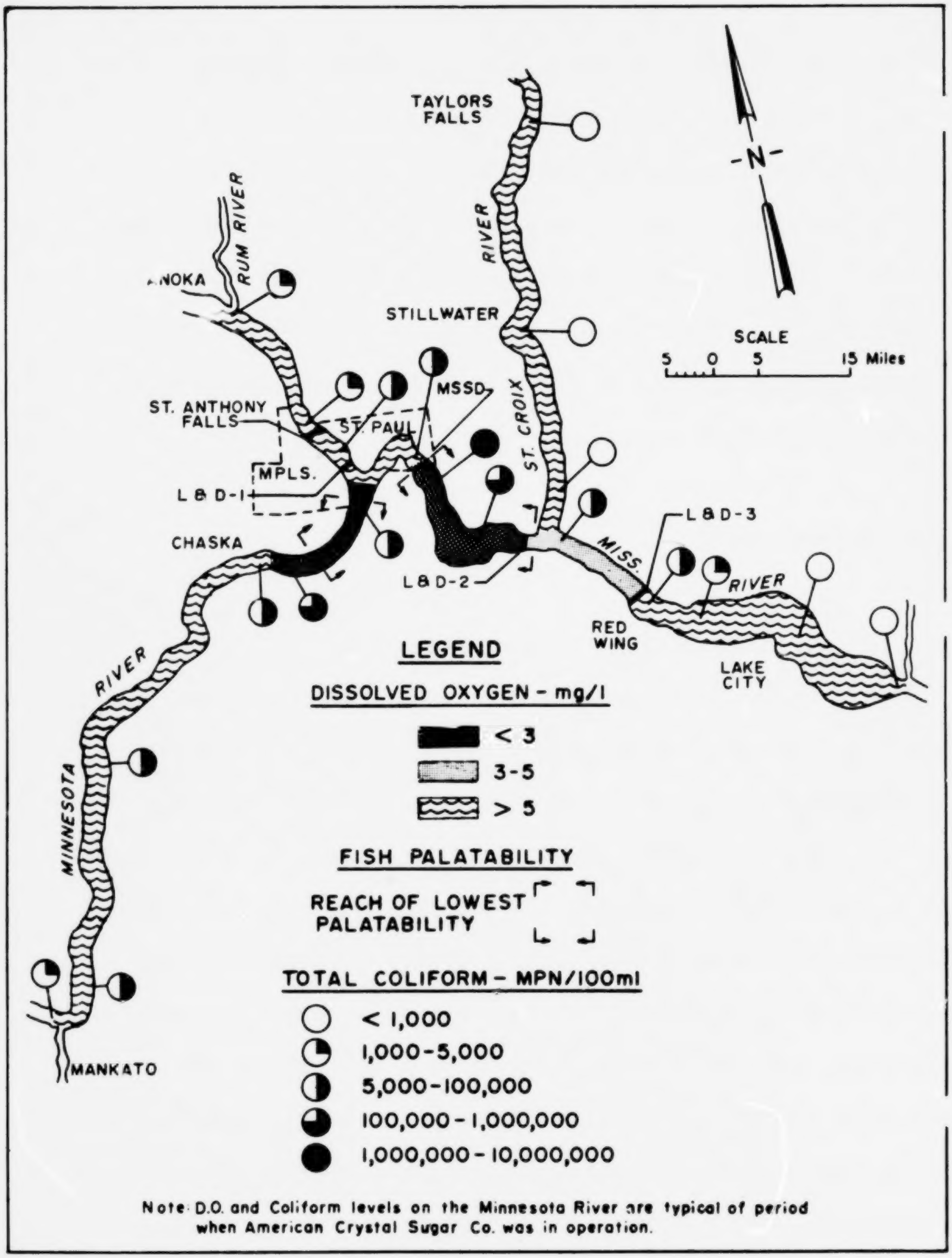
More recently, refined methods for isolation and detection of Salmonella organisms (producers of many intestinal diseases, including typhoid fever) have made it more practical to test for these specific infectious disease bacteria.

General water quality conditions found in the study area during the Project's survey are shown in Figure 12. Figures 13 through 18 show the river reaches that were found to be unsuitable for various water uses because of the water quality. The streams' flow (daily average) during this period ranged from 1.3 to 10 times the 7-consecutive day, once in 10-year low flow.

MISSISSIPPI RIVER

ANOKA TO ST. ANTHONY FALLS

The water quality of the Mississippi River between Anoka and St. Anthony Falls was unsatisfactory from a bacteriological standpoint, only. The average total coliform density in this segment ranged from 5,000 MPN/100 ml at Anoka to 4,000 MPN/100 ml a short distance above St. Anthony Falls. Fecal coliform counts were approximately 10 percent of the total counts. Almost all of this bacterial pollution originates upstream from the study area on the Mississippi and Rum Rivers. The only sources of bacterial pollution of any consequence along this segment are the Anoka sewage treatment plant and some of the metropolitan combined sewer overflows, including Bassett Creek. The Minneapolis water treatment plant and the


TAYLORS FALLS
RIVER
ST. CROIX
RUM RIVER
ANOKA
STILLWATER
ST. ANTHONY FALLS
ST. PAUL
MSSD
MPLS.
L & D-1
CHASKA
L & D-2
L & D-3
MISS.
RIVER
RED WING
LAKE CITY
MINNESOTA
RIVER
MANKATO
N
SCALE
5 0 5 15 Miles
LEGEND
DISSOLVED OXYGEN - mg/l
< 3
3-5
> 5
FISH PALATABILITY
REACH OF LOWEST PALATABILITY
TOTAL COLIFORM - MPN/100ml
< 1,000
1,000-5,000
5,000-100,000
100,000-1,000,000
1,000,000-10,000,000

Note: D.O. and Coliform levels on the Minnesota River are typical of period when American Crystal Sugar Co. was in operation.

FIGURE 12 – Typical water quality conditions during low flow periods in 1964 and 1965

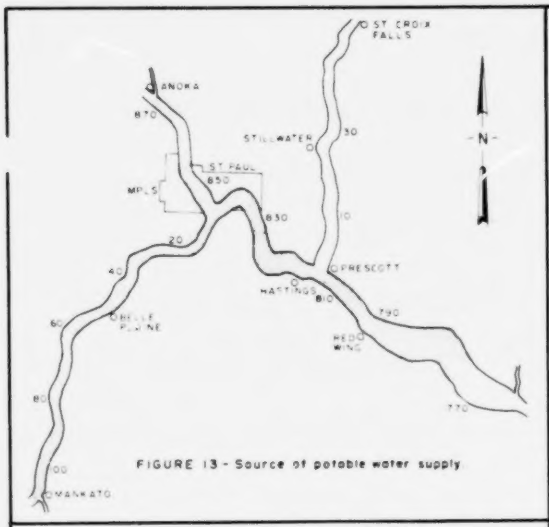

ST CROIX FALLS
ANOKA
870
STILLWATER
30
N
ST PAUL
850
MPLS
830
10
20
PRESCOTT
40
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 13 - Source of potable water supply.

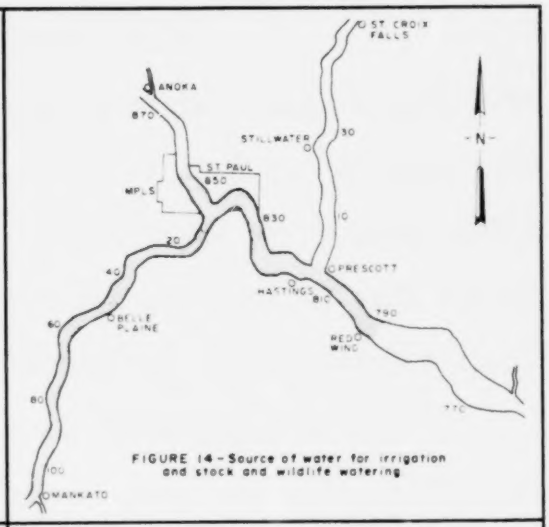
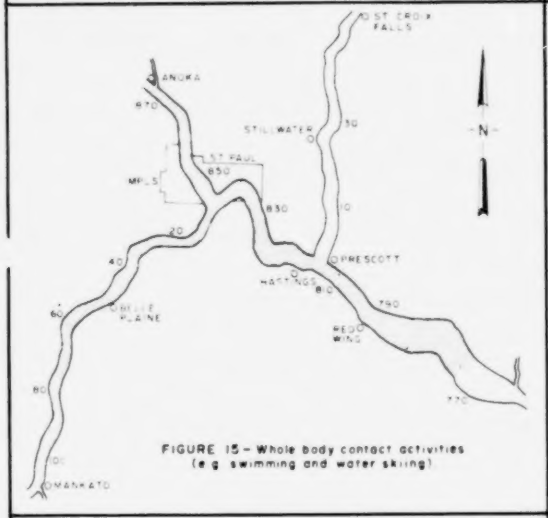

ST CROIX FALLS
ANOKA
870
STILLWATER
30
N
ST PAUL
850
MPLS
830
10
20
PRESCOTT
40
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 14 - Source of water for irrigation and stock and wildlife watering.


ST CROIX FALLS
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STILLWATER
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ST PAUL
850
MPLS
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PRESCOTT
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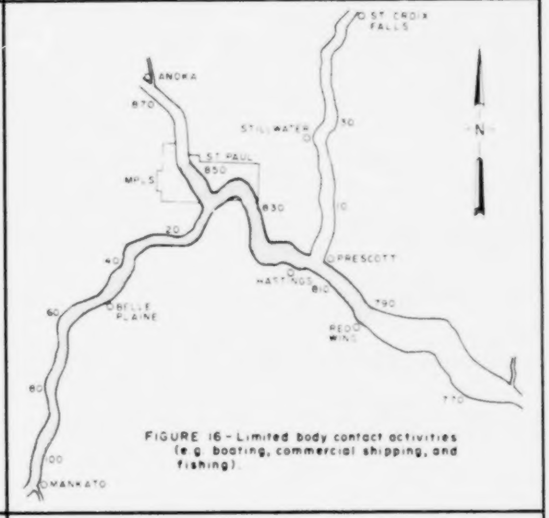
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 15 - Whole body contact activities (e.g. swimming and water skiing).


ST CROIX FALLS
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PRESCOTT
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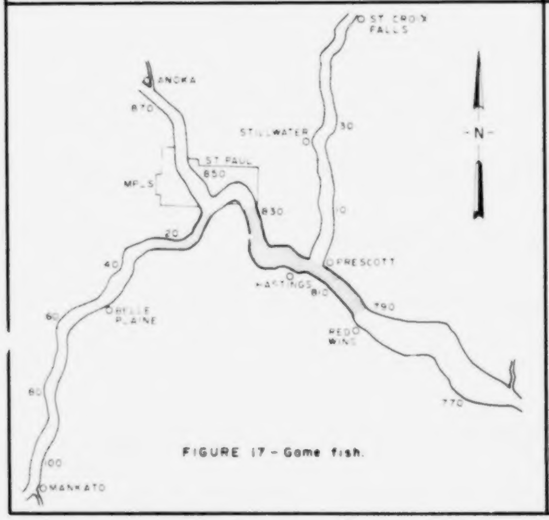
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 16 - Limited body contact activities (e.g. boating, commercial shipping, and fishing).


ST CROIX FALLS
ANOKA
870
STILLWATER
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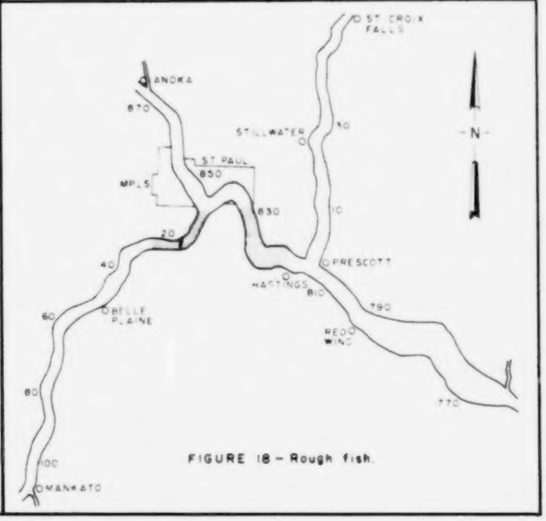
N
ST PAUL
850
MPLS
830
10
20
PRESCOTT
40
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 17 - Game fish.


ST CROIX FALLS
ANOKA
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STILLWATER
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ST PAUL
850
MPLS
830
10
20
PRESCOTT
40
HASTINGS
810
790
60
BELLE PLAINE
RED WING
80
770
100
MANKATO

FIGURE 18 - Rough fish.

LEGEND ▭ Designates unsuitable reaches.

FIGURES 13-18. RIVER REACHES UNSUITABLE FOR VARIOUS WATER USES.

Riverside steam-electric generating plant also discharge to this segment but do not contribute to the bacterial pollution. Minneapolis Water Works officials reported that a few tributaries to this segment are sometimes a source of high algal populations in the vicinity of their water intake.

In its present condition this segment of river is suitable for all uses except whole body water contact activities (e.g. swimming and water skiing). Before these activities could be practiced safely, the average total coliform density would have to be reduced to less than 1,000 organisms per 100 ml. Since water quality in this segment does not change appreciably with variations in flow (in the low and intermediate ranges), the water is suitable for all uses except whole body contact activities even at very low flows.

ST. ANTHONY FALLS TO MSSD OUTFALL

This segment of river receives waste water from more than 80 combined sewer overflows serving the Twin Cities as well as from the Minnesota River, High Bridge steam-electric generating plant, Minnesota Harbor Service, and Twin City Shipyard.

In dry weather the water quality is nearly as good as it is upstream of St. Anthony Falls. During and immediately following rainfall, however, the combined sewer overflows discharge into the reach, affecting the bacteriological quality. These discharges were sufficient in the summer and early fall of 1964 to increase the monthly average total coliform density along the segment from 4,000 MPN/100 ml at the upper end to approximately 30,000 MPN/100 ml at the lower end. Coliform data collected by the Minneapolis-St. Paul Sanitary District between 1942 and 1955 show similar average values at these locations for August and September. Fecal coliform counts were approximately 10 percent of the total counts.

The Minnesota River at its mouth is usually lower in quality than the Mississippi River immediately above their confluence. During the summer and early fall of 1964 the Minnesota River had an effect on dissolved oxygen and turbidity levels in the Mississippi River. The average dissolved oxygen level decreased from 8.0 to 7.7 mg/l and the average turbidity increased from $<$ 25 to 60 units as a result of the Minnesota River's inflow.

The other waste sources in this reach do not have an appreciable effect on water quality.

In its present condition this segment of the river is generally unsuitable for body contact activities such as swimming, boating, fishing, and navigation. Before the water would be suitable for the latter three activities, the average total coliform density would have to be reduced to less than 5,000 organisms/100 ml. To make this segment suitable for swimming or water skiing, the average total coliform density would have to be reduced to less than 1,000 organisms/100 ml and the turbidity reduced to 25 units or less in the reach below the mouth of the Minnesota River.

MSSD OUTFALL TO LOCK & DAM NO. 2

This segment of river receives wastes from the two largest contributors in the study area (MSSD and South St. Paul sewage treatment plants) as well as from 16 other smaller sources discussed previously and listed in Tables 2 and 4. As a result of these waste discharges this 21.1 mile reach of river had the lowest water quality of the entire study area.

Dissolved oxygen levels decreased from an average of 7.8 mg/l just above the MSSD outfall to an average of 2.9 mg/l in the vicinity of Spring Lake during the summer and early fall of 1964. The minimum dissolved oxygen level measured at this lower station during the same period was 0.5 mg/l. Winter levels were only slightly higher than summer levels in the lower 10 miles of this segment. The minimum daily river flow during this period has a recurrence interval of 4 years.

A. C. Printz, Jr.

Ammonia nitrogen levels exceeded 1.0 mg/1 (the maximum permitted for game fish) one or more times during the summer survey at all stations in the entire segment. Values were highest at a point two miles below the South St. Paul plant outfall, ranging from 0.57 to 2.01 mg/1 (2.0 mg/1 is maximum permitted for rough fish) and averaging 0.96 mg/1 during the summer and early fall of 1964. Ammonia nitrogen values were slightly higher during the winter of 1964-1965.

The bacteriological quality of the river decreased markedly below the MSSD outfall. The total coliform density ranged from 460,000 to 17,000,000 MPN/100 ml, averaging 6,500,000 MPN/100 ml between June and October of 1964 at a point 8.8 miles below the plant outfall. Above the outfall, the total coliform density averaged about 30,000 MPN/100 ml over this same period. The fecal coliform density throughout this reach averaged about 20 percent of the total density.

Pathogenic bacteria and viruses were also isolated from stream and waste samples collected along this segment. Fourteen species of Salmonella bacteria and three types of viruses were isolated from the MSSD effluent. Five species of Salmonella were isolated from the South St. Paul plant effluent. Ten species of Salmonella were found in the river a distance of six miles below MSSD (two miles below South

St. Paul). Ten miles downstream of MSSD, seven species of Salmonella were found.

Biologically, the river was relatively unpolluted above the MSSD outfall. Conditions changed abruptly however, at this point. Here, a zone of degradation began and extended downstream to the vicinity of the South St. Paul sewage treatment plant outfall. The remainder of the segment, down to Lock & Dam No. 2, was a zone of active decomposition. The river bottom was composed of organic sludge along the entire length of this segment. No clean water associated bottom organisms were found.

Carp was the predominant species of fish throughout Pool No. 2. In the reach between South St. Paul and Spring Lake, game fish made up only 6% of the total fish population. In the two-mile reach above Lock & Dam No. 2, they made up only 9% of the total population. Of all the fish evaluated in the study area by a taste panel, the flesh of those caught between South St. Paul and Lock & Dam No. 2 received palatability ratings which were among the lowest. Ratings ranged from 3.8 to 4.4. A rating of 4 or below indicated the fish flesh to be unacceptable.

The water quality found in this segment during the Project's surveys indicated that it was consistently suitable for only one use -- cooling water. To make this segment suitable for uses such as pleasure boating, navigation, fishing, stock and wildlife watering, irrigation, and the maintenance of rough fish, the minimum dissolved oxygen concentration should be maintained above 3 mg/1 and the average coliform density maintained less than 5,000 organisms/ 100 ml.

LOCK & DAM NO. 2 TO LOCK & DAM NO. 3

This segment of river, which lies in the pollution recovery zone, has three small waste sources discharging to it. (Hudson Manufacturing Co., Hastings Sewage Treatment Plant, and Prescott Sewage Treatment Plant). The dissolved oxygen level was generally increased by 1 or 2 mg/1 during passage over Lock & Dam No. 2. Water quality in this reach is also enhanced by the St. Croix River which enters the Mississippi River about four miles below Lock & Dam No. 2.

The minimum dissolved oxygen concentration recorded during the summer and early fall of 1964 between Lock & Dam No. 2 and the St. Croix River was 3.1 mg/1. Below the mouth of the St. Croix during this same period, the minimum concentration measured was 4.4 mg/1. Winter levels were also low. The minimum values recorded in the Mississippi River above and below the St. Croix's mouth during the winter of 1964-1965 were 2.1 and 5.7 mg/1, respectively.

Ammonia nitrogen levels were highest in the four-mile reach below Lock & Dam No. 2. During the surveys in the winter of 1964-1965, they ranged from 1.49 to 2.59 mg/1, averaging 2.12 mg/1.

The bacteriological quality of this segment was better than in the previous one, but was still poor. The total coliform density 1.2 miles below Lock & Dam No. 2 ranged from 2,300 to 350,000 MPN/100 ml, averaging 74,500 MPN/100 ml during the June-Ocotber 1964 period. Additional contributions by the Hastings and Prescott sewage treatment plants offset the improvement in bacteriological quality that would have resulted from dilution by the St. Croix River. Below the St. Croix River the coliform density decreased progressively with distance downstream due to natural dieoff. Just above Lock & Dam No. 3 the coliform density ranged from 3,300 to 130,000 MPN/100 ml, averaging 31,000 MPN/100 ml during the June-October 1964 period. Fecal coliform densities averaged 10 to 20 percent of the total densities in this segment.

Floating algae were found in greater numbers in the four-mile reach immediately below Lock & Dam No. 2 than at any point upstream. Their monthly average density at the one-foot depth ranged from 10,690/ml (in May) to 34,450/ml (in October) and averaged 21,200/ml, over the April-December 1964 period. Although these densities were rather high, they created no problems. Their presence was apparent only by microscopic examination. Their increase in density was due, primarily, to the increased nutrient load.

Greater numbers of game fish were found in this segment than in any of the previous ones. The Minnesota Department of Conservation determined that in 1964 game fish made up 46% of the total fish population in this pool.

The water quality found in the four-mile reach between Lock & Dam No. 2 and the mouth of the St. Croix River was unsuitable for all uses practiced. It would have been considered suitable for rough fish if the maximum ammonia nitrogen level had not exceeded 2.0 mg/1 and the minimum dissolved oxygen concentration had not fallen below 3 mg/1.

The reach between the mouth of the St. Croix River and Lock & Dam No. 3 was considered suitable for rough fish but not for game fish. Ammonia nitrogen levels exceeded 1.0 mg/1 and the minimum dissolved oxygen concentration fell below 5 mg/1.

To make the entire segment between Lock & Dam Nos. 2 and 3 suitable for uses such as swimming, water skiing, boating, sport and commercial fishing, and navigation, the average total coliform density should be reduced to less than 1,000 organisms/100 ml; the maximum ammonia nitrogen concentration reduced to 1.0 mg/1; and the minimum dissolved oxygen concentration increased to 5.0 mg/l.

LOCK & DAM NO. 3 TO CHIPPEWA RIVER

This segment of river also lies in the pollution recovery zone. It receives waste water from three municipal sewage treatment plants (Red Wing, Lake City, and Pepin), two processing industries (Foot Tanning Co. and Pittsburgh Plate Glass Co.), and the Red Wing steam-electric generating plant. These sources have little effect on water quality, however. Lake Pepin, which is a predominant portion of this segment, serves as a settling basin for silt and organic sludge carried in from upstream.

The water quality in this segment was unsatisfactory from a bacteriological standpoint. The average total coliform density decreased from 31,000/100 ml at the upper end to 250/100 ml at the lower end during the summer and early fall of 1964. Fecal coliform densities were from 5 to 10 percent of the total coliform densities. Most of the coliforms found in this segment had entered from upstream. The three sewage treatment plants in this segment, however, also added significant amounts of coliforms.

The Red Wing sewage treatment plant, largest of the three, was monitored on ten occasions for pathogenic bacteria and viruses. Positive results were obtained nine of the ten times from effluent samples. In all, seven species of Salmonella in addition to Polio, Coxsackie, and ECHO viruses were isolated.

Algal densities out in the mainstream were generally lower than those found in the previous segment. In shallow areas along the shores, however, densities were very high. During the summer of 1965, a greenish "pea soup consistency" algal bloom was observed in Lake Pepin at Stockholm Wisconsin's bathing beach. Rocks along the bathing beach were coated with a green slimy mass of algal cells. Another bloom was also observed at the Lake City Marina. The water was colored "pea green" and a thick green slime coated boat hulls. These and other observations demonstrate that algal populations can and do become a problem in the lower part of the study area.

Results of chlorophyll-a analyses on the plant cells found on artificial substrates placed in the river indicated that attached algae were about six times as abundant on those substrates in Lake Pepin as compared to those located elsewhere upstream. This increase in attached algal growths on substrates and free-floating algae in quiescent shallow areas was due largely to the nutrient and organic load received from upstream sources.

Nutrient concentrations in Lake Pepin were above values generally considered sufficient to produce algal blooms in lakes. Inorganic nitrogen levels averaged 0.70 mg/1 at the upper end and 0.54 mg/1 at the lower end. The orthophosphate level remained fairly constant throughout the entire segment, averaging 0.56 mg/1 (as PO_4).

Game fish were present in far greater numbers in this segment than anywhere else in the study area. The Minnesota Department of Conservation found that 68% of the fish population in Pool No. 4 were game fish. Flesh palatability tests made by a taste panel on fish caught at five stations distributed throughout this segment showed that flavor improved with distance downstream as far as midway through Lake Pepin. Beyond this point there was no detectable improvement.

In general, the water quality found in this segment indicated that it was suitable for maintenance of game fish as well as rough fish, esthetic enjoyment, and as a source of cooling water. The reach below the head end of Lake Pepin was also suitable for limited body contact activities and stock and wildlife watering. In addition to all of these uses, the reach below Lake City was also suitable for whole body contact activities (e.g. swimming and water skiing).

The upper reaches in this segment would also be suitable for all these water uses if the average total coliform density were reduced to less than 1,000 organisms/100 mg.

MINNESOTA RIVER

MANKATO TO CHASKA

This segment of river receives waste water from five sources in the Mankato area (Honeymead Products Co., Mankato sewage treatment plant, Archer Daniels Midland Co., Blue Cross Rendering Co., and Wilmarth electric plant) and one each from the cities of Le Sueur (Green Giant Co. plant), Henderson, and Belle Plaine (Minnesota Valley Milk Processing Association plant).

Except for a moderately high turbidity and coliform density, the water in this 79.9 mile segment was of reasonably good quality. The turbidity (resulting primarily from erosion) generally ranged from 25 to 220 units. The high values occurred during and immediately following periods of surface runoff. No one portion of the segment was consistently more turbid than another.

During the summer and early fall of 1964 the total coliform density in the river at Mankato just above the mouth of the Blue Earth River averaged approximately 5,000 MPN/100 ml. Waste sources from the Mankato area increased the average density to about 80,000 MPN/100 ml. At the 7-consecutive-day, once in 10 year summer low flow these waste sources would be expected to increase the coliform density to approximately 400,000 organisms/100 ml at a point 10 miles downstream. Beyond this point, and until reaching Chaska, the density would show a general decrease because ofbacterial dieoff.

Dissolved oxygen concentrations were consistently high (greater than 6.0 mg/l) in this segment. Waste loadings found during 1964 and 1965 do not have an appreciable effect on oxygen resources, even at low stream flows.

Algal densities at the one-foot depth were high throughout the entire segment, but were generally highest around Belle Plaine. Here, the density averaged 46,400/ml between April and December of 1964. Their presence in these numbers were generally obvious only upon microscopic examination, due partly to the natural turbidity of the water. At times, however, the water did have a greenish cast. Nutrient levels were well above values considered necessary to produce algal blooms in lakes. (Pools behind dams essentially become lakes at low stream flows.) Inorganic nitrogen and phosphates (as PO_4) levels averaged about 1.0 mg/l and 0.29 mg/l, respectively.

Bottom organism populations were very sparse (usually less than 10 mean numbers per square foot) throughout the entire segment. This was due to the sand and gravel bottom which provided few areas for organisms to attach themselves. The only region of organic sludge deposition was in the five-mile reach immediately below the Green Giant Company at Le Sueur. Pollution sensitive animals were present at most of the stations in this segment, but they generally accounted for less than 50% of the total kinds.

Because of the sparsity of bottom animals, turbid waters, and extreme range of flows there is a poor fish population in the Minnesota River. Of the fish present in this segment, only 15% were game fish. The palatability of fish caught at Mankato and Belle Plaine was also evaluated by a taste panel. Carp and walleye pike found in the vicinity of Mankato were considered in the intermediate range of palatability. Only carp were evaluated at Belle Plaine and they were of slightly lower palatability than those caught at Mankato.

The waters of this segment were considered suitable for use as a source of cooling water, esthetic enjoyment, and maintenance of a clean water associated organism community.

The waters were not suitable for irrigation, stock and wildlife watering, and limited body contact activities (e.g. boating and fishing) because the average coliform density along the entire segment exceeded 5,000 MPN/100 ml. The waters were not suitable for whole body contact activities (e.g.

swimming and water skiing) because the turbidity exceeded 1,000 MPN/100 ml along the entire length.

CHASKA TO MOUTH

This segment of river receives far greater quantities of wastes than the previous one. Its quality is lowest during the late fall and winter while one seasonal industry, the American Crystal Sugar Company is in operation. This segment also receives waste from the municipal sewage treatment plants of Chaska, Shaopee, Savage, Burnsville and Cedar Grove. The M. A. Gedney Co., Rahr Malting Co., Owens-Illinois Glass Co., American Wheaton Glass Co., Cargill, Inc., Twin City Shipyard and Blackdog electric plant also discharge to this segment.

During the period between June and October 1964, while American Crystal Sugar Company was out of operation, the dissolved oxygen profile decreased steadily from Shakopee (river mile 25.0) to the mouth. Above Shakopee the dissolved oxygen concentration ranged from 3.1 to 10.7 mg/1, averaging 6.6 mg/1.

Turbidity levels in this segment during the summer period were slightly higher than those found in the previous segment, especially near the mouth. The turbidity averaged 70 units at Chaska and 110 units near the mouth. It ranged from 25 to 240 units over the entire segment.

River temperatures exceeded 90°F at times of low stream flow in a one-mile reach immediately below the Blackdog steam-electric generating plant when cooling water was discharged directly to the river. On one occasion the temperature immediately below the point of discharge reached approximately 100°F.

The average total coliform density exceeded 5,000 MPN/100 ml over the entire segment. The density during summer was highest in the vicinity just below Shakopee. At that point (river mile 23.0) the coliform density ranged from 24,000 to 240,000 MPN/100 ml, averaging approximately 80,000 MPN/100 ml. Fecal coliform densities were between 10 and 20 percent of the total densities.

Algal densities and nutrient levels were of the same magnitude as those found in the previous segment. Although algal densities were high, they created no nuisance conditions.

There was a general increase in the number of bottom organisms below Chaska due primarily to the presence of organic sludge deposits. Pollution tolerant sludgeworms comprised the largest portion of the benthic population with as many as 237 and 487 per square foot being found in the fall and winter, respectively. Clean water associated animals were even less abundant in this segment than in the previous one. Game fish made up only 7% of the total fish population.

The palatability of carp caught in this segment immediately above the Blackdog power plant was also evaluated. They had the lowest level of palatability of all the fish assessed in the entire study area.

During the winter, dissolved oxygen levels were much lower and coliform densities were much higher in the lower 27 miles of river as a result of the additional wastes contributed by American Crystal Sugar Company. Ice cover also served to reduce dissolved oxygen levels by preventing reaeration. Except in a short reach of open water immediately below the Blackdog power plant, the dissolved oxygen concentration averaged less than 3 mg/l along the lower 20 miles of river during a three-day survey in February 1965. Dissolved oxygen concentrations at the mouth varied from 0.0 to 4.0 mg/l, averaging 1.8 mg/l.

Due largely to American Crystal Sugar Company's and Rahr Malting Company's discharges, coliform organisms in the river increased from 220 MPN/100 ml above the American Crystal Sugar outfall to 500,000 MPN/100 ml at a point 4.7 miles below the outfall. The coliform density decreased progressively with distance downstream below this point. Near the mouth, it averaged 9,600 MPN/100 ml.

The waters in this segment below Chaska were unsuitable for irrigation, stock and wildlife watering, navigation, and limited body contact activities because the average coliform density exceeded 5,000 MPN/100 ml.

The minimum dissolved oxygen concentration during the summer was too low below Shakopee and the maximum temperature was too high between river miles 8.4 and 3.0 for the waters to be suitable for the maintenance of game fish. Even if the DO and temperature had been suitable, however, it is very doubtful that game fish would have been present in great numbers because of the limited available food supply.

The waters were usually too turbid to be considered suitable for whole body contact activities (e.g. swimming and water skiing.)

During the winter survey this segment was also considered unsuitable for all fish because of extremely low dissolved oxygen levels. In addition, ammonia nitrogen levels exceeded the limit considered suitable for game fish.

To make the waters in this segment suitable for uses such as boating, fishing, stock and wildlife watering, irrigation, and the maintenance of rough fish, the minimum dissolved oxygen level should be maintained above 3 mg/l and the average coliform density maintained less than 5,000 organisms/100 ml.

ST. CROIX RIVER

Pollution in the St. Croix River is very slight. The water quality was suitable for all uses practiced in all except a few small isolated areas where coliform densities were high. These included the immediate vicinity of municipal waste outfalls belonging to Taylors Falls, St. Croix Falls, Osceola, Stillwater, Bayport, Hudson, and the Andersen Window Company industrial outfalls. The esthetic quality was affected in a few locations along the shoreline where algal blooms had occurred during late summer.

The municipal and industrial waste sources along the St. Croix River do not produce any significant changes in the general water quality even at very low flows. Agricultural and natural pollution, however, contribute nutrients in amounts generally considered sufficient to support nuisance algal blooms. Pollution from boats is sometimes evident in backwater areas, where debris is found occasionally.

To make the waters suitable for body contact activities, at all locations, waste effluents should receive more complete disinfection before being discharged. Better control of natural and agricultural sources is required if nutrient concentrations are to be lowered sufficiently to reduce algal densities in late summer. Greater control of discharges from boats is also required in order to protect the esthetic as well as the bacteriological quality of the waters.

OBSERVATIONS

STATE PROBLEMS

The problem of controlling water pollution is critically important in this urbanized society. The problem is very complex in the variety and depth of interests involved and in the governmental arrangements that exist to do something about it. Much of the authority of water pollution control, however, rests with the State governments. Therefore, progress toward solving the problem will be influenced in a very large measure by the effectiveness of State action.

When a State budget is prepared, water pollution control activities have to compete with other desirable programs for a share of available funds, particularly where it is a subsidiary activity of another agency (such as a Public Health Department). Up to now this has usually resulted in a shortage of funds and staff for most State water pollution control programs. The most serious impact of this shortage is the necessary concentration of available resources to meet urgent critical needs at the expense of comprehensive measures and long-range planning.

In view of the growing pressure that will be exerted on the State pollution control agencies as pollution problems become more intense and the public concern more insistent, there is a great need for a strong, efficient agency in every State with adequate resources in finance, personnel and technical equipment.

In 1964 the Public Health Service contracted the Public Administration Service, Chicago, Illinois, for a study, the central purpose of which was to develop standards against which State agencies and other interests could gauge the adquacy of personnel complements and budgetary support for State water pollution control programs. Minimum and desirable staffing and budget needs were determined for each State. The needs estimated for Minnesota and Wisconsin (in 1964) are given in the table below along with actual staffing and budget figures. It should be kept in mind that these estimates were prepared in 1964, before the increased emphasis on water pollution control and the establishment of standards of water quality. Also, the estimates were based on salary and expense levels lower than those now prevailing.

COMPARISON OF NEEDED AND ACTUAL STAFFING AND BUDGET ALLOCATIONS

TO STATE WATER POLLUTION CONTROL AGENCIES

STATE	TOTAL STAFFING	AVERAGE SALARY $	TOTAL BUDGET $	TOTAL BUDGET PER CAPITA (CENTS)
Minnesota				
Minimum, 1964	58		530,000	15
Desirable, '64	104	6,849	946,000	27
Actual FY '66	35	---	338,336	
Actual FY '67	35		345,327	
Wisconsin				
Minimum, 1964	71		646,000	16
Desirable, '64	126	6,849	1,145,000	28
Actual FY '66	24	8,094	267,206	
Actual FY '67	81		1,193,832	

The investigators feel that staffing and budget needs for the State water pollution control agencies in the State of Minnesota and Wisconsin should be maintained no lower than the "desirable" level given in the preceding table.

METROPOLITAN PROBLEMS

The complicating factor in the water pollution problem is that water refuses to recognize city, county, or State boundaries. It simply flows downhill. When a city fails to clean up its own wastes, the chief victim is not the city itself but its neighbor downstream; similarly, when the city meets its responsibilities, it is the neighbor who appears to benefit most.

The problem is compounded when the cities within a given metropolitan area attempt to meet their responsibilities on an individual basis. Such an approach results in much duplication of effort, higher unit costs, and no guarantee that a solution will ever be obtained. Certainly, there is very little hope that the optimum solution could ever be achieved under such an approach.

Planning and action to alleviate metropolitan problems of sewage collection, treatment, and disposal can be handled best by a single authority. Through this approach efforts can be coordinated and directed most efficiently toward a set of consistent objectives. This reduces the possibility of one city inadvertently solving its problems at the expense of another. The metropolitan approach can also be economically advantageous since, within limits, the per capita investment for the construction and operation of sewage treatment facilities decreases as the size of the facility increases. Whether the best solution lies in the use of one or several plants is irrelevant; the important point is that all sewage facilities be planned as part of an integrated system encompassing the entire metropolitan area.

In the Minneapolis-St. Paul metropolitan area, there are approximately 80 communities. The two core cities operate a sanitary district created in 1933 to handle wastes from Minneapolis, St. Paul, and those adjacent outside areas which might contract with either of the two cities for sewage disposal. To date, approximately 30 communities have contractual arrangements with them. Plans prepared by the Minneapolis-St. Paul Sanitary District as required by Minnesota law, to eventually serve the remaining communities has met with resistance. The Minnesota Water Pollution Control Commission has approved the engineering aspects of these plans, considering them as an acceptable solution to the metropolitan sewage problem. Many of the suburbs, however, have expressed opposition to the plan, principally its financial aspects. Many of these suburban communities wish to form separate districts while others are providing for their own sewage disposal.

There has been an increasing awareness of the need for coordination in solving the metropolitan area sewage disposal problems on the part of city, county, and State officials, civic leaders, and most State legislators. Many of them have submitted proposals but unfortunately, none have been fully accepted by all the factions involved. Several bills pertaining to the metropolitan problem have been submitted to the legislature in previous sessions. Some passed; others died in committee. Although little progress toward a solution has actually been made, the concern shown by these activities offers a note of optimism.

The investigators feel that all communities within the metropolitan area should unify their positions and press for the establishment of an overall metropolitan sanitary authority. This authority should control all plant operations on a unified basis and provide for the coordination of local policy in the development of a regional water strategy. This authority should, however, fall under the jurisdiction of the Minnesota Water Pollution Control Commission.

CONCLUSIONS

Sewage and industrial wastes discharged to the Mississippi River from Minnesota cause pollution in the interstate waters of the Mississippi River which endangers the health and welfare of persons in Wisconsin and, therefore, is subject to abatement under the provisions of the Federal Water Pollution Control Act.

1. The following sources of waste water discharged to the Mississippi during the period of investigation:

Anoka Sewage Treatment Plant
Minneapolis Water Treatment Plants
NSP Riverside Steam-Electric Generating Plant
NSP High Bridge Steam-Electric Generating Plant
Minnesota Harbor Service
Twin City Shipyard
Minneapolis-St. Paul Sanitary District Sewage Treatment Plant
Swift Company
Union Stockyards
Armount and Company
King Packing Company
So. St. Paul Sewage Treatment Plant

Newport Sewage Treatment Plant

Inver Grove Sewage Treatment Plant

Northwestern Refining Company

St. Paul Park Sewage Treatment Plant

J. L. Shiely Company - Larson Plant

J. L. Shiely Company - Nelson Plant

General Dynamics - Liquid Carbonic Division

St. Paul Ammonia Products Company

Great Northern Oil Company

Northwest Cooperative Mills

Cottage Grove Sewage Treatment Plant

Minnesota Mining and Manufacturing Company

Hudson Manufacturing Company

Hastings Sewage Treatment Plant

Prescott Sewage Treatment Plant

S. B. Foot Tanning Company

Pittsburgh Plate Glass Company

Red Wing Sewage Treatment Plant

NSP Red Wing Steam-Electric Generating Plant

Lake City Sewage Treatment Plant

Pepin Sewage Treatment Plant

2. The following sources of waste water discharged to the Minnesota River during the period of field

investigation:

Honeymead Products Company

Mankato Sewage Treatment Plant

Archer Daniels Midland Company

Blue Cross Rendering Company

NSP Wilmarth Power Plant

Green Giant Company

City of Henderson

Minnesota Valley Milk Producers Cooperative Assoc.

Chaska Sewage Treatment Plant (includes Gedney Co. wastes)

American Crystal Sugar Company

Rahr Malting Company

Shakopee Sewage Treatment Plant

Owens-Illinois Forest Products

American Wheaton Glass Company

Savage Sewage Treatment Plant

Minnesota Masonic Home

Cargill, Inc.

Twin City Shipyard

Burnsville Sewage Treatment Plant

NSP Blackdog Power Plant

Cedar Grove Sewage Treatment Plant

3. The following sources of waste water discharged to the St. Croix River during the period of investigation:

St. Croix Falls Sewage Treatment Plant
Taylors Falls Sewage Treatment Plant
Osceola Sewage Treatment Plant
Stillwater Sewage Treatment Plant
Andersen Window Company
Bayport Sewage Treatment Plant
United Refrigerator Company
Hudson Sewage Treatment Plant

4. The discharge of excessive amounts of wastes produced oxygen concentrations below 5 mg/1 in the following stream reaches:

a. Mississippi River between the Minneapolis-St. Paul Sanitary District sewage treatment plant and Lock and Dam No. 3 (39.4 mile reach) during summer of 1964.

b. Mississippi River between the Minneapolis-St. Paul Sanitary District sewage treatment plant and St. Croix River (25.0-mile reach) during the winter of 1964-1965.

c. Minnesota River between Shakopee and its mouth (25.4-mile reach) during the summer of 1964.

d. Minnesota River between Chaska and its mouth (27.7-mile reach) during the winter of 1964-1965.

5. The discharge of excessive amounts of wastes produced oxygen concentrations below 3 mg/l in the following stream reaches:

a. Mississippi River between the Minneapolis-St. Paul Sanitary District sewage treatment plant and Lock & Dam No. 2 (21.1-mile reach) during the summer of 1964 and the winter of 1964-1965.

b. Minnesota River between Chaska and the mouth (27.7-mile reach) during the winter of 1964-1965.

6. Minnesota River temperatures exceeded 90 and 93°F on occasion in a one-mile reach immediately below the Northern States Power Company's Blackdog steam-electric generating plant.

7. The average turbidity exceeded 25 Jackson units in the following stream reaches during the summer of 1964:

a. Mississippi River between the Minnesota

River and the head of Lake Pepin (59.0-mile reach).

b. Minnesota River from some point above Mankato (the limit of the study area) to the mouth.

8. Ammonia nitrogen levels exceeded 2.0 mg/l in the Mississippi River between Lock & Dam No. 2 and the St. Croix River (3.9-mile reach) during the winter of 1964-1965.

9. Ammonia nitrogen levels exceeded 1.0 mg/l in the following stream reaches:

a. Mississippi River between the Minneapolis-St. Paul Sanitary District sewage treatment plant and Lock & Dam No. 3 (39.4-mile reach) during the period of the survey.

b. Lower 15 miles of the Minnesota River during the winter of 1964-1965.

10. Phenol levels occasionally exceeded 0.01 mg/l in a 20-mile reach immediately below the Minneapolis-St. Paul Sanitary District sewage treatment plant.

11. The average concentration of the nutrients, inorganic nitrogen and phosphorus, exceeded 0.3 (as N) and

0.03 (as P) mg/1, respectively, throughout the three major streams studied.

12. Average coliform densities exceeded 1,000 MPN/100 ml in the following stream reaches during all surveys:

a. Mississippi River from some point above Anoka (limit of study area) to Lake City.

b. Minnesota River from some point above Mankato (limit of study area) to the mouth.

13. Average coliform densities exceeded 5,000 MPN/100 ml in the following stream reaches during all surveys:

a. Mississippi River between St. Anthony Falls and the head of Lake Pepin (70-mile reach).

b. Minnesota River between the Blue Earth River at Mankato and the mouth (109.2-mile reach).

14. Pathogenic bacteria and enteric viruses were present in the following stream reaches:

a. Mississippi River between St. Paul and Grey Cloud Island (10 miles below the Minneapolis-St. Paul Sanitary District Plant).

b. Mississippi River immediately below Red Wing sewage treatment plant.

15. Algae reached nuisance proportions in the following locations:

- a. Mississippi River's Lake Pepin in shallow areas along the shorelines.
- b. St. Croix River's Lake St. Croix in shallow areas along the shorelines.

16. Bottom sediment consisted of a mixture of organic sludge and sand in the following stream reaches during 1964:

- a. Mississippi River between Lock & Dam No. 1 and the Minneapolis-St. Paul Sanitary District sewage treatment plant (11.3-mile reach).
- b. Mississippi River between Lock & Dam No. 2 and the head of Lake Pepin (30-mile reach).
- c. Minnesota River along a five-mile reach immediately below the Green Giant Company (at LeSueur).
- d. Minnesota River between American Crystal Sugar Company (at Chaska) and the mouth (27.7-mile reach).
- e. All of Lake St. Croix (lower 23 miles of the St. Croix River.

17. Bottom sediment consisted almost solely of organic sludge in the following stream reaches during 1964:

a. Mississippi River between the Minneapolis-St. Paul Sanitary District sewage treatment plant and Lock & Dam No. 2 (21.1-mile reach).

b. All of Lake Pepin (lower 22 miles of Mississippi River under study).

18. Fish caught in the lower 10 miles of the Minnesota River and in the segment of Mississippi River between South St. Paul and the St. Croix River had lower levels of palatability than fish caught elsewhere in the study area.

RECOMMENDATIONS

GENERAL

River water quality shall be preserved or upgraded, as required, to permit maximum use and full recreational enjoyment of the waters. Remedial measures necessary to attain this goal are given in the recommendations. The recommendations are given in two groups: General and specific. General recommendations cover the broad objectives of pollution abatement in the Project area. Specific recommendations are given for the solution of particular problems and are offered in addition to, not in place of, the general recommendations.

These recommendations represent the initial phase of a long-range and more comprehensive water resource development program for the entire Upper Mississippi River Basin. They apply to problems needing immediate correction.

Although fertilization of the rivers and backwater areas is undesirable, no recommendations are made at this time concerning the installation of specialized treatment facilities designed to reduce nitrogen and phosphorus compounds in the waste effluents. Operation of treatment facilities so as to optimize nutrient removal will reduce the problem.

RIVER SEGMENT		(MAXIMUM OR MINIMUM CONCENTRATIONS FOR ANY ONE SAMPLE)	
FROM (RIVER MILE)	TO (RIVER MILE)	DO (Min.) mg/l	COLIFORM GUIDE (Maximum)[1]
Mississippi River			
871.6 (Anoka)	836.3 (MSSD)	No deterioration in present level (7.5mg/l)	A&C[2]
836.3 (MSSD)	815.2 (L&D No. 2)	3	B
815.2 (L&D No. 2)	763.5 (Chippewa River)	5	A
Minnesota River			
109.2 (Mankato)	30.0 (Chaska)	No deterioration in present level (7.5 mg/l)	B
30.0 (Chaska)	0.0 (Mouth)	3	B
St Croix River			
52.0 (Taylors Falls)	0.0 (Mouth)	No deterioration in present level (7.5 mg/l)	A

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[1] See following pages for explanation of Coliform Guide.

[2] Coliform Guide C. applies to the segment between Anoka and St. Anthony Falls, only.

A. C. Printz, Jr.

MUNICIPALITIES, INSTITUTIONS, AND INDUSTRIES

GENERAL RECOMMENDATIONS

It is recommended that:

PROTECTION OF EXISTING WATER QUALITY

1. There be no further decrease in quality of any of the waters within the Study Area (Mississippi River between Anoka, Minnesota, and the outlet of Lake Pepin; Minnesota River in and below Mankato, Minnesota; and St. Croix River in and below St. Croix Falls, Wisconsin.)

ENHANCEMENT OF WATER QUALITY

2. Water quality be enhanced as stipulated in the remaining recommendations to provide the following dissolved oxygen and coliform levels in the given segments of the Mississippi, Minnesota, and St. Croix Rivers during flows equal to or greater than the 7-consecutive-day, once in 10-year summer and winter low flows. (Refer to Table on Page 129)

(1) Coliform Guides

COLIFORM GUIDE A - Recreational whole body use. The water uses for which this guide is intended are those that entail total and intimate contact of the whole body with the water. Examples of such use are swimming, skin diving, and water skiing, in which the body is totally immersed and some ingestion of the water may be expected. The recommended guide value for coliforms is 1,000 per 100 milliliters (1,000/100 ml). For all waters in which coliform levels are below the guide value of 1000/100 ml, the water is considered suitable provided there is proper isolation from direct fecal contamination as determined by a sanitary survey. Situations may arise wherein waters having coliform counts somewhat higher than the guide value can be used, provided supplemental techniques are used to determine safe bacterial quality. The analysis for fecal streptococci is more definitive for determining the presence of organisms of intestinal origin, and is suggested as the supplemental technique to be employed. A coliform level of 5,000/100 ml is considered satisfactory, provided the fecal streptococcus count is not more than 20/100 ml, and provided also that there is proper isolation from direct fecal contamination as determined by a sanitary survey.

The waters designated for whole body contact use should be maintained acceptable for this use at least between May and October, inclusive. During the remainder of the year when the weather is unsuitable for whole body contact activities, these waters should conform to Coliform Guide B.

COLIFORM GUIDE B - Recreational, limited body contact use and commercial shipping (barge traffic). The water uses for which this guide is intended are those that entail limited contact between the water user and the water. Examples of such uses are fishing, pleasure boating, and commercial shipping. Recommended guide value for coliforms is 5,000/100 ml. For all waters in which coliform levels are below this guide value, the water is considered suitable for use, provided there is proper isolation from direct fecal contamination as determined by a sanitary survey.

COLIFORM GUIDE C - Applies to municipal water source. Where municipal water treatment includes complete rapid-sand filtration or its equivalent, together with continuous post-chlorination, source water may be considered acceptable if the coliform concentration (at the intake) averages not more than 4,000/100 ml.

If the foregoing water quality is assured, then the water will be suitable for the following uses in each of the given river segments.

	WATER USE	RIVER SEGMENT
a.	Source of municipal water supply	Mississippi River: Anoka - St. Anthony Falls St. Croix River: Taylors Falls - Mouth
b.	Maintenance of habitat for Group I[3] fish	Mississippi River: Anoka - MSSD L&D No. 2 - Chippewa River Minnesota River: Mankato - Chaska St. Croix River: Taylors Falls - Mouth
c.	Whole body contact recreational activities	Mississippi River: Anoka - Minnesota River L&D No. 2 - Chippewa River St. Croix River: Taylors Falls - Mouth
d.	Maintenance of habitat for Group II[4] fish	All portions of 3 major streams
e.	Irrigation	All portions of 3 major streams
f.	Stock and wildlife watering	All portions of 3 major streams
g.	Limited body contact recreational activities	All portions of 3 major streams
h.	Source of non-potable industrial process water	All portions of 3 major streams
i.	Source of cooling water	All portions of 3 major streams
j.	Commercial fishing	All portions of 3 major streams
k.	Navigation	All portions of 3 major streams

	WATER USE	RIVER SEGMENT
l.	Hydroelectric power generation	All portions of 3 major streams
m.	Esthetic enjoyment	All portions of 3 major streams

3 & 4 See following for explanation of Group I and Group II fish.

(3) GROUP I FISH - Are those generally sought after by sport fishermen and include but are not limited to the following species: Walleyed Pike, Sauger, Northern Pike, Black Crappie, White Crappie, Largemouth Bass, Smallmouth Bass, Rock Bass, White Bass, Bluegill, Channel Catfish, Sturgeon, Flathead Catfish, Green Sunfish, Pumpkinseed Sunfish, and Brown Trout.

(4) GROUP II FISH - Are those generally sought after by commercial fishermen in this area and include but are not limited to the following species: Carp, Quillback, Sheepshead, Brown Bullhead, Bigmouth Buffalo, Northern Carpsucker, Northern Redhorse, Longnose Gar, Shortnose Gar, Bowfin, Mooneye, Gizzard Shad, Common Sucker, Spotted Sucker, Yellow Bullhead, Black Bullhead, Golden Shiner, Perch, and River Sucker.

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TREATMENT OF MUNICIPAL WASTES

3. All municipalities and other institutions discharging sewage to the rivers under investigation provide at least secondary biological treatment plus continuous disinfection of the effluent. This treatment is to produce an effluent containing no more than:

a. 20 percent of the mass of 5-day (20°C) BOD originally contained in the effluent.

b. 20 percent of the mass of suspended solids originally contained in the effluent.

c. 5,000 coliforms/100 ml (except where "d" applies).

d. 1,000 coliforms/100 ml between May and October, inclusive, where receiving waters are used for whole body contact activities (see preceding list).

These limits are to be followed except where more stringent ones are given in the specific recommendations or are required by State Water Pollution Control agencies.

REPORTS BY MUNICIPAL TREATMENT PLANTS

A. C. Printz, Jr.

4. Municipal waste treatment plants maintain at least the minimum laboratory control and records as recommended by the Conference of State Sanitary Engineers at their 38th Annual Meeting in 1963 (See Appendix). In addition, all plants should maintain a record of chlorine feed rates and those plants of 2 million gallons/day capacity, or greater, should provide analyses for total and fecal coliforms on a once per week basis. Results of laboratory tests and other pertinent records should be summarized monthly and submitted to the appropriate State agency for review and evaluation. These records are to be maintained in open files of the State agency for use by all persons with a legitimate interest.

PHOSPHATE REMOVAL

5. New waste treatment facilities be designed to provide adequate capacity of individual units and components as well as maximum flexibility in order to permit later modification in operating procedures so as to effect the greatest amount of phosphate removal. Existing plant facilities should be operated so as to optimize phosphate removal.

MONITORING OF WATER QUALITY

6. The States of Minnesota and Wisconsin establish a program of monitoring and surveillance in area waters for evaluating progress in improvement of stream quality resulting from implementation of actions recommended by the conferees. The FWPCA should establish monitoring stations where appropriate on portions of the Mississippi and Minnesota Rivers within the State of Minnesota to aid in the evaluation. Water quality surveillance activities should be coordinated and all information made available to the States, the FWPCA, and other parties with a legitimate interest.

BYPASSING AND SPILLING OF WASTES

7. All present and future sewerage and sewage treatment facilities be modified or designed and operated to eliminate bypassing of untreated wastes during normal maintenance and renovation operations. The appropriate State agency (Minnesota Water Pollution Control Commission or Wisconsin Department of Resource Development) is to be contacted for approval prior to any expected bypassing of waste. All accidental or emergency bypassing or spillage should be reported immediately.

PRETREATMENT OF WASTES

8. Wastes (such as sludge from the St. Paul water treatment plant) which discharge into a municipal sewerage system be pretreated to avoid any detrimental effect on waste treatment operation.

PROTECTION AGAINST SPILLAGE

9. Programs be developed by those responsible for the facilities to prevent or minimize the adverse effect of accidental spills of oils, gases, fuels, and other material capable of causing pollution. The elements of such programs should include:

a. Engineering works such as catchment areas, relief vessels, and dikes to trap spillage.

b. Removal of all spilled materials in a manner acceptable to the regulatory agencies.

c. Immediate reporting (by those responsible for the facilities) of any spills to the appropriate State agency.

d. In-plant surveys and programs to prevent accidental spills.

COMBINATION STORM AND SANITARY SEWERS

10. Combined storm and sanitary sewers be prohibited in all newly developed areas and be eliminated in existing areas wherever opportunity to do so is afforded by redevelopment. Present combined sewers should be continuously patrolled and operated so as to convey the maximum possible amount of combined flows to and through the waste treatment plant. In addition, studies to develop effective control of wastes from this source should be continued by the MSSD and should be initiated by the City of South St. Paul. Although the immediate problem is a bacterial one, both studies should also consider the discharge of BOD and solids. Methods to be used to control wastes from combined sewers and a time schedule for their accomplishment should be reported to the conferees within two years after issuance of the Conference Summary.

TREATMENT OF INDUSTRIAL WASTES

11. All industries discharging wastes to the rivers under investigation, unless otherwise specified, provide treatment sufficient to produce an effluent

containing no more than 20 percent of the mass of 5-day (20°C) BOD and suspended solids originally contained in the untreated process waste. Settleable solids and coliforms in the effluent are not to exceed the following:

a. Settleable solids - 5 ml/l

b. Coliforms - 5,000/100 ml (except where "c" applies).

c. Coliforms - 1,000/100 ml between May and October, inclusive, where receiving waters are used for whole body contact activities (see preceding list).

REPORTING OF INDUSTRIAL WASTES

12. Industries discharging wastes to the waters maintain operating records containing information on waste discharge rates and concentrations of constituents found in significant quantities in their wastes.

This information should be summarized and submitted to the appropriate State agency at monthly intervals for review and evaluation. These records are to be maintained in open files of the State agency for use by all persons with a legitimate interest.

VESSEL WASTES

13. All watercraft provide adequate treatment on board or arrange for suitable on-shore disposal of all liquid and solid wastes.

GARBAGE AND REFUSE DUMPS

14. Garbage or refuse not be dumped along the banks of the river and no open dumps be allowed on the flood plain. Material in present dump sites along the river banks should be removed and the appearance of the bank restored to an esthetically acceptable condition. Present open dumps on the flood plain should be converted to sanitary landfills operated acceptably to the appropriate State agencies.

UPSTREAM BACTERIAL CONTROL

15. Waste sources upstream from and outside of the study area on the Mississippi, Minnesota, and St. Croix Rivers and their tributaries be sufficiently controlled so that waters entering the study area conform to General Recommendation No. 2.

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SPECIFIC RECOMMENDATIONS - MISSISSIPPI RIVER

Specific recommendations are offered in addition to, and not in place of, the general recommendations.

MUNICIPAL SOURCES

It is recommended that:

MSSD TO SOUTH ST. PAUL - MAXIMUM BOD AND SUSPENDED SOLIDS LOADINGS

1. Maximum waste loadings from all sources between and including the Minneapolis-St. Paul Sanitary District and the South St. Paul Sewage Treatment Plants be such that a minimum dissolved oxygen content of 3.0 mg/l can be maintained during the 7-consecutive-day, once-in-10-year low summer flow in the reach of river between Mississippi River miles 836.4 and 815.2. To attain this, combined wastes loads from these sources should not exceed 68,500 pounds/day of 5-day (20°C) BOD, exclusive of combined sewer overflows. Suspended solids loadings discharged to this reach (exclusive of combined sewer overflows) should not exceed 85,500 pounds/day in order to minimize sludge deposits.

MAXIMUM PHENOLIC LOADINGS

2. Maximum loadings of phenolic wastes from the Minneapolis-St. Paul Sanitary District sewage treatment plant, Northwestern Refining Co., Great Northern Oil Co., and Minnesota Mining and Manufacturing Co., all combined, not exceed 110 pounds/day in order to maintain the stream concentration of this material under 0.01 mg/l at stream flows equal to or greater than the 7-consecutive-day, once-in-10-year low flow.

BYPASSING AT MSSD

3. An engineering study of the Minneapolis-St. Paul Sanitary District sewerage system be undertaken to determine what changes are required to make unnecessary the practice of bypassing wastes periodically for the purpose of cleaning the inverted siphon under the Mississippi River.

HASTINGS PLANT

4. The BOD removal efficiency at the Hastings, Minnesota, primary sewage treatment plant be increased from

the 5 percent figure found during the survey to a minimum of 30 percent until secondary biological treatment facilities are in operation.

INDUSTRIAL SOURCES

It is recommended that:

WATER TREATMENT PLANTS OF THE CITY OF MINNEAPOLIS

1. Treatment facilities be provided capable of producing an effluent with a suspended solids concentration not exceeding that found in other treated effluents being discharged to the same reach of river. At no time should the daily average suspended solids concentration exceed 50 mg/l.

The two water treatment plants of the City of Minneapolis discharge sand filter backwash water to the river without prior treatment. Together the two plants discharge approximately 0.69 mgd of backwash water having an average suspended solids concentration of 1,900 mg/l.

SWIFT & CO., ARMOUR & CO., AND SO. ST. PAUL UNION STOCKYARDS

2. The industries in the South St. Paul area (Swift & Company, Armour & Company, and the St. Paul Union Stockyards) provide an effective method of control and correction of direct discharges to the Mississippi River. These include so-called clean waste waters, watering trough overflows, truck washing wastes, surface drainage, and hog pen flushings. The coliform densities of any of these discharges should not exceed 5,000/100 ml once the control devices are in operation.

NORTHWEST COOPERATIVE MILLS

3. Additional treatment be provided to reduce the suspended solids concentrations of the compositing pond effluent to substantially the same levels found in other effluents being discharged to the same reach of river after satisfactory treatment. In no instance should the daily average suspended solids concentration exceed 50 mg/l.

The discharge from the compositing pond averages 46,000 gallons/day (gpd) and contains about 420 mg/l of suspended solids.

FOOT TANNING COMPANY

A. C. Printz, Jr.

4. Any additional facilities constructed for the company's waste produce an effluent of a quality acceptable to the Minnesota Water Pollution Control Commission (MWPCC) and in conformity with recommendations in this report. The possibility of discharging the settled waste to the Red Wing sewerage system in lieu of additional treatment should be considered and a report on the conclusions of such questions submitted to the MWPCC.

On April 1, 1966, the company submitted to the MWPCC plans and specifications for a primary clarifier and a study plan for evaluating secondary treatment methods.

SPECIFIC RECOMMENDATIONS - MINNESOTA RIVER

MUNICIPAL SOURCES

No specific recommendations.

INDUSTRIAL SOURCES

It is recommended that:

GREEN GIANT COMPANY

1. An additional pump be provided for standby purposes at the waste water sump for use when the main pump

fails. The sanitary and miscellaneous process wastes should be handled as specified by General Recommendations 3 and 11.

This company had pump failures at the waste water collection sump where process waste is collected and pumped to ridge and furrow fields. When pump failure occurs, the waste is discharged directly to the river. Some sanitary and miscellaneous process wastes are discharged directly to the river without treatment as a normal practice.

AMERICAN CRYSTAL SUGAR CO. AND RAHR MALTING CO. MAXIMUM BOD AND SUSPENDED SOLIDS LOADINGS

2. Maximum waste loadings from all sources between and including the American Crystal Sugar Co., and the Rahr Malting Co. be such that a minimum dissolved oxygen content of 3.0 mg/l can be maintained during the 7-consecutive-day, once-in-10-year low winter flow in the reach of river between Minnesota River miles 29 and 0. To attain this, combined waste loads from these sources should not exceed 12,000 pounds/day of 5-day (20°C) BOD during winter when there is no ice cover in the vicinity of the Blackdog power plant. At times of complete ice cover, the maximum waste loading of 5-day (20°C) BOD from these sources should not

exceed 6,500 pounds/day. In no case, however, should treatment efficiency be less than that specified in the General Recommendations.

NORTHERN STATES POWER COMPANY BLACKDOG PLANT

3. A water temperature of not greater than 90°F be maintained in the lower Minnesota River. To attain this, the existing cooling pond should be utilized to its fullest extent during the summer at stream flows less than 1500 cfs. During these periods the thermal addition to the Minnesota River should not exceed 13.5 billion BTU/day.

SPECIFIC RECOMMENDATIONS - ST. CROIX RIVER

MUNICIPAL SOURCES

No specific recommendations.

INDUSTRIAL SOURCES

No specific recommendations.

FEDERAL INSTALLATIONS

Federal installations contribute less than 0.1

percent of the pollution entering the three major streams studied. Although their contributions are small, full consideration is still given to Federal installations, in compliance with Section 11 of the Federal Water Pollution Control Act as amended (33 U.S.C. 466 et seq.)

U. S. ARMY - NIKE MISSILE INSTALLATIONS

GENERAL RECOMMENDATIONS

It is recommended that:

1. A minimum of one hour per day be devoted to proper treatment, plant operation and maintenance.

2. The treatment facilities be operated such that removal efficiencies approach those for which the plants were designed.

3. Laboratory analyses and records maintenance consistent with recommendations of the Conference of State Sanitary Engineers for plants of 0.25 mgd capacity be carried out. A report of these functions, including results of analyses, are to be furnished to the Federal Water Pollution Control Administration upon request.

SPECIFIC RECOMMENDATIONS

NIKE SITE NO. 20, ROBERTS, WISCONSIN

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No specific recommendations.

NIKE SITE NO. 40, FARMINGTON, MINNESOTA

It is recommended that:

1. Discharge of effluent to the roadside ditch be terminated as soon as possible. The present outfall sewer line should be extended so as to discharge the effluent into the unnamed creek which at present ultimately receives the waste.

2. Continuous chlorination facilities be activated immediately with disinfection sufficient to produce a free chlorine residual of 0.5 mg/l after a 15 minute contact at peak flow rates.

NIKE SITE NO. 70, ST. BONIFACIUS, MINNESOTA

No specific recommendations.

NIKE SITE NO. 90, BETHEL, MINNESOTA

It is recommended that continuous chlorination facilities be activated immediately with disinfection sufficient to produce a free chlorine residual of 0.5 mg/l after a 15 minute contact at peak flow rates.

U. S. AIR FORCE - AIR DEFENSE COMMAND

OSCEOLA, WISCONSIN STATION

It is recommended that a schedule of maintenance practices be instituted consistent with accepted procedures for operation of oxidation ponds so as to insure satisfactory treatment.

U. S. ARMY CORPS OF ENGINEERS

LOCKS AND DAMS

It is recommended that:

1. Present plans be continued concerning improvement or replacement of inadequately sized treatment facilities.

2. At stream flows of 7,000 cubic feet per second (cfs) or less (as measured at the St. Paul gage), as much water as possible be passed over bulkheads before the Taintor gates at Lock & Dam No. 2. At flows of 3,000 cfs or less, the equivalent of the inflow to Pool No. 2 should be passed over the bulkheads.

FLOATING DREDGE THOMPSON

It is recommended that a planned schedule of analyses be continued on effluent from the waste treatment facilities so as to insure adequate removals prior to overboard discharge of effluent.

U. S. AIR FORCE - 934TH TROOP CARRIER GROUP

OFFICERS CLUB

It is recommended that the present single compartment septic tank be changed to a two compartment tank. A subsurface tile field of adequate size should be installed to supplement the present field.

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SCHEDULE FOR REMEDIAL PROGRAM

MUNICIPALITIES, INSTITUTIONS, AND INDUSTRIES

In light of the excellent progress the state agencies have made in making various industrial firms and municipalities aware of the need for abatement facilities, the following time schedule for the foregoing remedial program is recommended. The time periods given commence with the issuance of the Conference Summary by the Secretary of the Interior.

a. Submission of preliminary plans for remedial facilities within 6 months.

b. Submission of final design for remedial facilities within 12 months.

c. Financing arrangements for municipalities completed and construction started within 18 months.

d. Construction completed and plants placed into operation within 36 months.

e. Existing schedules of the State agencies calling for earlier completion dates are to be met.

FEDERAL INSTALLATIONS

Schedules for Federal installations requiring only operational and maintenance changes shall be initiated immediately. Changes required at Nike Site No. 40 and the Ft. Snelling Officers Club should be completed and made operational within 6 months.

SCHEDULE MODIFICATIONS

It is recognized that modifications in this schedule may be necessary. These may include:

a. A lesser time where the control agency having jurisdiction considers that a practical method of control can be in operation prior to the time stated.

b. In a few industries and municipalities some variation from this schedule may be sought from the appropriate State and local pollution control agencies. In such cases after review the conferees may make appropriate recommendations to the Secretary of the Department of the Interior.

APPENDIX

TABLE 1

SUMMARY OF FEDERAL INSTALLATIONS

FACILITY	TYPE OF TREATMENT	FINAL DISPOSAL
U. S. Air Force		
Osceola Air Force Station	Secondary	Ground
934th Troop Carrier Group Officers Club	Primary	Marsh area near Minnesota River
U. S. Army Corps of Engineers		
Upper St. Anthony Falls	Primary	Ground
Lower St. Anthony Falls	Primary	Ground
Lock & Dam No. 1	Primary	Ground
Lock & Dam No. 2	Primary	Ground
Lock & Dam No. 3	Primary	Ground
U. S. Army		
Nike Site No. 90		
Administration Site	Secondary	Tributary to Rum River
Launch Site	Primary	Ground
Dog Kennels	Primary	Ground

FACILITY	TYPE OF TREATMENT	FINAL DISPOSAL
Nike Site No. 70		
Administration Site	Secondary	Slough
Launch Site	Primary	Ground
Dog Kennels	Primary	Ground
Nike Site No. 40		
Administration-Launch Site	Secondary	Unnamed Creek
Radar Control Site	Primary	Ground
Dog Kennels	Primary	Ground
Nike Site No. 20		
Administration Site	Secondary	Pond
Launch Site	Primary	Ground
Dog Kennels	Primary	Ground
Twin Cities Army Ammunition Plant		
Cooling & Storm Water	None	Round Lake (Company Owned)
Zeolite Softener Backwash Water	None	Rice Creek (Tributary on Mississippi Riv.)
Other Wastes	(to municipal system)	

TABLE 7

SUMMARY OF DOMESTIC WASTE CHARACTERISTICS

SOURCE	RIVER MILE	AVG. FLOW RATE MGD	POPULATION SERVED	TYPE OF TREATMENT					INFLUENT	EFFLUENT	AVERAGE CONSTITUENT CONCENTRATIONS									REMOVAL EFFICIENCY PERCENT	
				PRI-MARY	SEC-ONDARY	TER-TIARY	[illegible]	[illegible]			5-DAY BOD mg/l	COD mg/l	SUSPENDED SOLIDS TOTAL, mg/l	SUSPENDED SOLIDS VOLATILE mg/l	NITROGEN TOTAL, mg/l	NITROGEN NO_3 mg/l	TOTAL PHOSPHATE mg/l	COLIFORM DENSITY (DURING SUMMER) TOTAL MPN	COLIFORM DENSITY (DURING SUMMER) FECAL MPN	BOD	TOTAL SUSPENDED SOLIDS
MISSISSIPPI RIVER																					
Anoka STP[1]	871.5	0.96	9,500		x		x		x	x	299 19	659 164	[illegible] 46	223 13	30.5	0.7	20.7	3.6×10^{7} $>2.7 \times 10^{5}$	4.3×10^{7} $>2.6 \times 10^{5}$	93	81
Mpls.-St. Paul San. Dist. STP[2]	836.3	188.6	1,200,000	x					x	x	251 174	585 378	316 107	226 81	24.7 22.2	[illegible]	11.8 11.5	$>1.6 \times 10^{7}$	4.3×10^{6}	31	66
So. St. Paul STP[2]	832.4	14.2	25,000		x				x	x	1,298 272	- -	855 90	790 70	46.5	-	19.1	3.9×10^{6}	2.5×10^{6}	79	89
Newport STP[1]	831.0	0.058	800		x			x	x	x	157 14	161 78	117 34	95 29	4.6	16.4	22.6	1.12×10^{7} 5.5×10^{6}	1.01×10^{6} 9.5×10^{5}	91	71
Inver Grove STP	830.3	0.020	230		x		x				(Effluent seeps into ground before reaching River)									-	-
St. Paul Park STP	829.0	0.35	5,100		x				x	x	217 61	968 216	190 61	168 46	18.2	0.5	43.2	8.1×10^{7} 8.7×10^{6}	1.6×10^{7} 2.8×10^{6}	72	67
Cottage Grove STP[1]	819.6	0.425	6,500		x		x		x	x	240 96	535 210	198 55	162 51	19.5	<1	56.2	8.2×10^{6} 4.2×10^{6}	2.3×10^{6} 1.3×10^{6}	77	72
Hastings STP	813.8	0.80	8,070	x					x	x	>188 180	387 368	205 118	176 99	26.8	1.2	33.0	9.8×10^{7} 6.6×10^{7}	4.1×10^{7} 2.0×10^{7}	<5	42
Prescott STP[1]	809.8	0.135	1,390	x				x	x	x	366 246	672 494	316 133	268 86	47.0	1.8	57.8	1.6×10^{8} 2.1×10^{7}	2.5×10^{7} 9.0×10^{6}	33	58
Red Wing STP	790.2	2.2	11,000		x				x	x	232 78	409 144	256 68	204 12	7.9	3.6	21.0	3.3×10^{7} 2.0×10^{6}	1.3×10^{7} 4.4×10^{5}	66	81
Lake City STP[1]	772.6	0.26	3,190	x				x	x	x	203 96	499 250	203 81	172 67	35.8	0.9	25.8	6.3×10^{7} 2.3×10^{7}	4.9×10^{7} 1.6×10^{7}	53	60
Pepin STP	767.2	0.054	900	x					x	x	508 303	684 596	255 157	213 133	62.6	0.8	75.5	2.3×10^{8} 1.1×10^{7}	7.1×10^{7} 5.5×10^{6}	40	37

1 Coliform densities were measured while chlorination facilities were operating

2 Also receives industrial wastes

3 Coliform densities were measured while the plant was not chlorinating.

TABLE 2 (Continued)

SUMMARY OF DOMESTIC WASTE CHARACTERISTICS

SOURCE	RIVER MILE	AVG. FLOW RATE MGD	POPULATION SERVED	PRI-MARY	SEC-ONDARY	TER-TIARY	CONT. Cl_2	SUMMER Cl_2	INFLUENT	EFFLUENT	AVERAGE CONSTITUENT CONCENTRATIONS: 5-DAY BOD mg/l	COD mg/l	SUSPENDED SOLIDS: TOTAL, mg/l	SUSPENDED SOLIDS: VOLATILE, mg/l	NITROGEN: TOTAL, mg/l	NITROGEN: NO_3, mg/l	TOTAL PHOSPHATE mg/l	COLIFORM DENSITY (DURING SUMMER): TOTAL MPN	COLIFORM DENSITY (DURING SUMMER): FECAL MPN	REMOVAL EFFICIENCY PERCENT: BOD	REMOVAL EFFICIENCY PERCENT: TOTAL SUSPENDED SOLIDS
MINNESOTA RIVER																					
Mankato STP[1,2]	106.5	4.54	21,400	x			x		x	x	139 96	253 227	130 71	105 55	- 15.1	- 4.1	7.1	[illegible] x 10^7 1.5 x 10^5	2.6 x 10^7 9.8 x 10^5	+32	45
Henderson	70.0	0.04	500		NONE															0	0
Chaska STP[2]	29.4	0.46	2,300		x				x	x	696 41	- -	286 145	241 87	- 15.3	- 0.2	- 12.1	<8.2 x 10^7 1.76 x 10^5	<1.3 x 10^6 <6.0 x 10^5	94	49
Shakopee STP[3]	23.9	0.31	4,700	x				x	x	x	204 118	380 276	224 90	184 75	- 15.0	- 0.0	- 12.1	1.60 x 10^7 2.55 x 10^7	1.50 x 10^7 1.13 x 10^7	42	60
Savage STP[1]	14.4	0.22	1,700		x		x		x	x	>127 > 11	263 85	89 24	72 14	- 12.3	- 2.4	- 12.5	1.7 x 10^7 6.7 x 10^5	9.2 x 10^6 1.4 x 10^4	91	73
Burnsville STP[1]	10.5	0.51	4,400		x		x		x	x	>122 10	240 7[illegible]	238 48	135 35	- 17.7	- 0.0	- 13.5	1.0 x 10^7 4.8 x 10^5	1.3 x 10^6 1.4 x 10^5	>92	79
Cedar Grove STP[1]	7.3	0.09	2,200		x		x		x	x	303 [illegible]	521 149	311 59	253 43	- 21.8	- 6.8	- 11.6	2.7 x 10^7 1.5 x 10^5	8.7 x 10^6 1.1 x 10^5	93	81
ST. CROIX RIVER																					
St. Croix Falls STP	51.9	0.18	1,100		x			x	x	x	101 55		184 64	[illegible] 52	- 18.6	- 0.1	- -	- -	- -	46	65
Taylors Falls STP[1]	51.8	0.070	500		x			x	x	x	122 20	158 94	115 38	90 32	- 9.5	- 7.7	15.3	1.4 x 10^7 7.4 x 10^5	8.7 x 10^6 1.7 x 10^5	71	67
Osceola STP[1]	44.3	0.097	930	x				x	x	x	240 144	460 101	252 95	200 76	- 8.7	- 0.6	10.7	1.8 x 10^6 1.2 x 10^5	1.0 x 10^6 5.9 x 10^5	40	62
Stillwater STP [1,2]	21.2	1.79	7,480	x				x	x	x	180 84	275 174	105 71	95 52	15.5	0.0	11.7	<1.9 x 10^7 1.1 x 10^7	7.34 x 10^7 1.1 x 10^6	53	32
Bayport STP[1]	19.4	0.40	3,000		x		x		x	x	247 9	320 41	178 8	101 6	3.4	4.3	15.8	[illegible]	[illegible]	96	96
Hudson STP	16.3	0.56	5,000		x			x	x	x	130 21.1	- -	212 28	186 26	- 18.1	- 6.8	- -	- -	- -	52	87

1. Coliform densities were measured while chlorination facilities were operating
2. Also receives industrial wastes
3. Coliform densities were mea[illegible] while the plant was not chlorinating

TABLE 3

SUMMARY OF DOMESTIC WASTE LOADING RATES TO STREAMS

SOURCE	RIVER MILE	AVG. FLOW RATE MGD	AMOUNT OF GIVEN CONSTITUENT DISCHARGED							
			5-DAY BOD lb./day	Suspended Solids		Nitrogen		Total Phosphate lb./day	Coliforms	
				Total lb./day	Volatile lb./day	Total lb./day	NH_3 lb./day		Total No./Day	Fecal No./Day
MISSISSIPPI RIVER										
Anoka STP	871.5	0.96	190	365	265	245	8	190	$<1.0 \times 10^{13}$	[illegible]
Mpls-St. P.San. Dist.	836.7	188.6	268,000	170,000	128,000	55,000	-	20,900	$<1.1 \times 10^{13}$	[illegible]
So. St. Paul STP	832.4	14.2	32,200	10,000	8,270	5,900	-	2,500	[illegible]	[illegible]
Newport STP	831.0	0.058	7	16	13	[illegible]	8	10	[illegible]	[illegible]
Inver Grove STP	830.3	0.020	(Effluent seeps into ground before reaching River)							
St. Paul Park STP	829.0	0.35	175	180	135	110	2	175	1.1×10^{13}	[illegible]
Cottage Grove STP	819.6	0.42	195	195	190	150	-	190	[illegible]	[illegible]
Hastings STP	813.5	0.90	1,100	700	660	165	5	200	[illegible]	[illegible]
Prescott STP	809.8	0.135	290	130	95	90	7	50	[illegible]	[illegible]
Red Wing STP	790.2	2.20	1,410	800	550	145	65	400	[illegible]	[illegible]
Lake City STP	772.0	0.26	205	175	145	75	1	50	[illegible]	[illegible]
Pepin STP	767.2	0.054	135	70	60	30	<1	5	[illegible]	[illegible]
MINNESOTA RIVER										
Mankato STP	106.5	4.54	3,900	3,000	2,000	570	90	970	[illegible]	[illegible]
Henderson	70.0	0.04	85 (Est.)	100(Est.)	65(Est.)	15(Est.)		1 (Est.)	[illegible] (Est.)	
Chaska STP	29.4	0.46	160	560	470	60	1	50	[illegible]	[illegible]
Shakopee STP	23.9	0.31	305	235	220	30	2	60	[illegible]	[illegible]
Savage STP	14.4	0.22	<20	45	25	25	4	25	[illegible]	[illegible]
Burnsville STP	10.5	0.51	40	205	150	75	1	25	[illegible]	[illegible]
Cedar Grove STP	7.5	0.09	13	55	30	15	1	10	[illegible]	[illegible]
ST. CROIX RIVER										
St. Croix Falls STP	51.9	0.18	85	100	80	35	<1	10(Est.)	-	-
Taylors Falls STP	51.8	0.070	10	20	20	7	2	10	[illegible]	[illegible]
Osceola STP	44.3	0.037	115	75	60	30	<1	25	[illegible]	[illegible]
Stillwater STP	21.2	1.73	1,250	1,300	775	200	9	350	[illegible]	[illegible]
Bayport STP	15.6	0.40	30	25	20	10	11	10	[illegible]	[illegible]
Hudson STP	16.3	0.50	110	130	105	75	30	100(Est.)	-	-

TABLE 4

SUMMARY OF INDUSTRIAL WASTES CHARACTERISTICS

INDUSTRIAL WASTE SOURCE	RIVER MILE	AVG. FLOW RATE MGD	TYPE OF TREATMENT	AVERAGE CONSTITUENT CONCENTRATIONS																						
								SOLIDS					NITROGEN			PHOSPHATES										
				pH	Alka-linity mg/1	5-Day BOD mg/1	COD mg/1	TOTAL mg/1	VOLA-TILE mg/1	TOTAL SUSP. mg/1	VOL. SUSP. mg/1	SETT. mg/1	ORGA-NIC mg/1	AMMO-NIA mg/1	NO_3 mg/1	TOTAL mg/1	ORTHO mg/1	CHLO-RIDE mg/1	FLUO-RIDE mg/1	SUL-FATE mg/1	OIL & GREASE mg/1	PHENOL	CHRO-MIUM	TOTAL MPN	FECAL MPN	FECAL STREP. N/100 ml
MISSISSIPPI RIVER																										
Mpls. Water Trtmt Plants Filt. Backwash Water Lime Sludge	859.0 857.8 858.3	0.7 1.6	None Settling Ponds	8.4 10.2	42	1.7 -				1,000 37	100 -													[illegible] -	[illegible] -	
Riverside Power Plant	856.9	592.6[1]	None for Cooling Water																							
Highbridge Power Plant	840.5	449.1[1]	None for Cooling Water																							
Minnesota Harbor Service	840.4		Settling Pond																							
Twin City Shiphard	837.3		Screens																							
Swift & Company	833.4	5.0	None for Cooling Water																							
Union Stockyards	833.2	2.0	None for Direct Discharge																							
Armour & Company	833.0	2.4	None for Cooling Water																							
King Packing Company	832.5	1.73	None for Cooling Water	7.7	350	7.5 Est.	4.9	325	97	7	5	-	12.8	7.1	3.0	0.3	0.2	8	-	-	-	-	-	-	-	-
Northwestern Refining Company	830.0	1.44	Oil Separator, Lagoons	8.4	320	22	74	653	139	17	11	-	1.8	23.2	<0.2	2.7	1.2	100	1.3	-	7.8	1000	-	[illegible]	[illegible]	
J. L. Shiely Company Larson Plant Nelson Plant	 826.5 825.0	 1.44 8.64	 Settling Pond Settling Pond																							
General Dynamics Liq. Carb. Div.	824.2	0.70	None	7.2	540	-	6.5	574	210	35	28	-	0.2	0.6	3.9	3.5	0.8	-	-	-	-	-	-	-	-	-
St. Paul Ammonia Products Company	824.2	0.66	Oil Separator, Settling Pond	8.0	190	14	52	2602	474	21	<14	-	5.8	90.4	84.5	7.9	3.8	-	-	-	17.8	22	-	[illegible]	[illegible]	-
Great Northern Oil Company	824.0	3.23	Oil Separator, Sec. Sett. Ponds	7.6	240	16	110	1087	220	39	30	-	0.6	62.8	0.1	3.8	1.6	88	-	-	1.6	134	-	[illegible]	[illegible]	-
Northwest Coop. Mills Pond Leakage (INC 371) Comp. Pond Eff(INC 370)	823.8	 0.070 0.046	 Storage Pond Settling Pond	 4.9 6.2	 1200 870	 16 34	 130 260	 17820 10850	 5405 4707	 2244 419	 461 228	 1.4 17.2	 111.1 114.2	 471.8 [illegible]	 5.5 4.1	 8010 2780	 7500 1000	 - -	 [illegible] [illegible]	 - -	 - -	 - -	 - -	 - [illegible]	 - [illegible]	 - -
Minn. Mining & Mfg. Co. Cooling Water (IMM 359) Treated Waste (IMM 358) Cooling and Waste (IMM 357)	817.2	 4.08 1.68 5.76	 None for C. Wtr. Neut. & Sett. Tanks, Ponds (See Above)	 8.1 7.5 7.5	 300 370 370	 16 220 120	 48 490 180	 357 1212 736	 105 214 169	 9 35 86	 6 24 39	 - - -	 0.4 6.9 12.4	 4.7 95.6 26.8	 2.1 9.7 3.2	 10.5 58.2 44.7	 7.0 42.5 22.2	 - - -	 - - 11.1	 - - -	 - - 3.4	 26 751 466	 - - -	 [illegible] [illegible] [illegible]	 [illegible] [illegible] [illegible]	 - - -
H.D. Hudson Manufacturing Company	814.2	-	Chem. Precip.																							
Foot Tanning Company Raw Waste (IPT 391) Treated Waste (IPT 390)	792.8	 1.03 1.03	 (Inf. to Lagoons) Screens & Lagoons	 7.6 9.1	 670 480	 330 170	 1100 490	 7110 5744	 1551 545	 [illegible] [illegible]	 [illegible] [illegible]	 55 1.7	 <0.2 0.2	 33.0 27.6	 1.7 0.9	 25.8 5.6	 8.8 0.1	 - -	 - -	 - -	 - -	 - -	 - 13	 [illegible] <13	 [illegible] <13	
Pittsburgh Plate Glass Company	790.7	1.0	None for Cooling Water																							
Red Wing Power Plant	789.4	53.9[1]	None for Cooling Water																							

1. Maximum rate of discharge.
2. Based on one sample.

TABLE 4 (Continued)

SUMMARY OF INDUSTRIAL WASTES CHARACTERISTICS

INDUSTRIAL WASTE SOURCE	RIVER MILE	AVG. FLOW RATE MGD	TYPE OF TREATMENT	AVERAGE CONSTITUENT CONCENTRATIONS																						
				pH	Alkalinity mg/l	5-Day BOD mg/l	COD mg/l	SOLIDS TOTAL mg/l	SOLIDS VOLATILE mg/l	SOLIDS TOTAL SUSP. mg/l	SOLIDS VOL. SUSP. mg/l	SOLIDS SETT. mg/l	NITROGENS ORGANIC mg/l	NITROGENS AMMONIA mg/l	NITROGENS NO_3 mg/l	PHOSPHATES TOTAL mg/l	PHOSPHATES ORTHO mg/l	CHLORIDE mg/l	FLUORIDE mg/l	SULFATE mg/l	OIL & GREASE mg/l	PHENOL	CHROMIUM	COLIFORMS TOTAL MPN	COLIFORMS FECAL MPN	FECAL STREP. No./100 ml
RUM RIVER																										
Cornelius St. Sewer, Anoka	0.8	0.1[2]	None	7.6	480	4.2	13	382	141	10	7	-	1.2	2.5	2.0	14.1	10.6	30	-	16	0.3	-	0.02	6.5×10^3	2.0×10^3	-
Taylor St. Sewer, Anoka	0.7	Low	None	7.8	410	7.8	28	430	153	27	13	-	1.1	3.7	3.0	13.2	5.8	29	-	38	6.5	-	-	2.0 x 10[illegible]	1.0 x 10[illegible]	-
Taylor St. Sewer, Anoka	0.6	Low	None	7.6	480	16	33	474	129	46	9	-	<1.4	7.1	3.7	11.6	2.9	28	-	120	5.6	-	-	2.1 x 10[illegible]	1.3 x 10[illegible]	-
BLUE EARTH RIVER																										
Honeymead Products Company	0.6	4.3	Oil Separator, Acidulation	7.2	350	58	78	700	172	24	20	-	1.2	2.2	0.2	7.2	2.8	-	-	-	16.8	-	-	2.2×10^3	1.1×10^3	-
MINNESOTA RIVER																										
North Star Concrete Products Company	108.2	0.86	Settling Pond																							
Archer Daniels Midland Co.	106.0	0.042	None for Cooling Water	7.9	460	5.0	9.0	636	138	102	18	-	1.2	0.8	0.9	7.0	2.0	-	-	-	1.8	-	-	2.4×10^4	1.1×10^3	-
Blue Cross Rendering Company	105.5																									
Treated Waste		0.036	Trickling Filtr	7.1	990	1200	2700	4347	2086	1555	777	-	23.4	142.6	2.8	68.4	46.6	1000	-	-	103	-	-	<5.7 x 10[illegible]	<2.4 x 10[illegible]	-
Cooling Water		0.058	Grease Trap	7.7	530	700	1000	543	121	27	22	-	0.9	44.0	0.2	5.9	3.4	-	-	-	1.7	-	-	2.7 x 10[illegible]	<1.7 x 10[illegible]	-
Wilmarth Power Plant	105.2	33.1[1]	None for Cooling Water																							
Green Giant Company	75.4																									
Wastes (IOG 236)		1.25	Irrigation Flds	7.7	630	1200	1900	5768	2881	371	221	1.0	30.2	4.2	1.3	20.9	15.8	-	-	-	-	-	-	3.0 x 10[illegible]	5.6 x 10[illegible]	-
San. + Misc. (IOG 235)		0.014	None	7.7	560	200	500	4282	959	135	109	0.5	11.6	2.3	0.6	5.1	2.9	-	-	-	-	-	-	5.7 x 10[illegible]	2.1 x 10[illegible]	-
Cooling Water (IOG 233)		0.216	None	8.0	520	54	180	861	226	26	18	0.1	2.9	0.5	0.1	3.1	1.0	-	-	-	-	-	-	1.1 x 10[illegible]	1.1 x 10[illegible]	-
Minnesota Valley Milk Processing Association	49.8	0.27	None--Aeration Ditch not in use	7.9	590	130	280	1390	425	120	49	-	9.7	1.6	0.2	22.0	14.6	-	-	-	-	-	-	<6.3 x 10[illegible]	<2.4 x 10[illegible]	-
American Crystal Sugar Co.	27.7	7.0	None	9.0	530	650	1000	10150	1365	766	<165	-	11.3	1.3	1.4	6.0	2.7	-	-	-	-	-	-	>1.0 x 10[illegible]	2.3 x 10[illegible]	5.3x10[illegible]
M. A. Gedney Company	27.5	0.40	Stab. Ponds																							
Rahr Malting Company	25.4	2.0	Screens	-	-	300	690	5087	720	38	>34	-	6.7	1.3	3.8	-	-	-	-	-	-	-	-	1.3 x 10[illegible]	6.1 x 10[illegible]	7.7x10[illegible]
Owens-Illinois Glass Company	20.9	0.02	"Rated" Aeration	7.8	280	11	58	393	183	34	28	-	0.6	0.1	<0.1	1.9	1.4	-	-	-	7.9	-	-	71	45	-
American Wheaton Glass Co.	20.7	0.20	None for Process Wastes	8.0	230	8.3	23	290	136	33	9	<0.1	0.0	0.0	1.5	0.2	0.2	-	-	-	20.8	-	-	4.0×10^2	57	-
Cargill, Inc.	13.4	3.32	Screens & Oil Separation	7.9	360	25	68	620	122	33	22	-	2.0	1.0	<0.1	9.0	4.0	4	-	-	2.7	-	-	>1.2 x 10[illegible]	<2.1 x 10[illegible]	-
Twin City Shipyard																										
Cargill Location	13.2		Screens																							
Blackdog Location	8.0		Screens																							
Blackdog Power Plant	8.4	371.5[1]	Cooling Pond																							
ST. CROIX RIVER																										
Andersen Window Company	20.2																									
Upper Waste Disch. (IAW 157)		0.014	None	7.7	500	40	110	472	258	54	41	0.75	16.0	35.2	<0.6	2.3	0.4	-	-	-	-	-	-	1.1 x 10[illegible]	<0.5 x 10[illegible]	-
Middle Waste Disch. (IAW 156)		0.216	None	7.7	490	4.9	12	286	90	18	12	<0.1	<0.5	<0.2	1.2	6.6	0.9	-	-	-	-	-	-	2.5 x 10[illegible]	<36	-
Cooling Water (IAW 155)		0.216	None for Cooling Water	7.6	510	1.4	5.4	239	63	9	4	<0.1	0.6	0.5	0.4	0.9	0.2	-	-	-	-	-	-	>3.6 x 10[illegible]	<2.0 x 10[illegible]	-
United Refrigerator Company	16.5	0.059	None	7.8	-	4	-	268	106	256	6	-	-	-	-	0.8	-	-	-	-	-	-	1.4			

1. Maximum rate of discharge.
2. Based on one sample.

TABLE 5

SUMMARY OF MORE SIGNIFICANT INDUSTRIAL WASTE LOADING RATES TO STREAMS

(Results are in Pounds/Day, except where noted otherwise)

SOURCE	RIVER MILE	AVG. FLOW RATE MGD	OPERATION			5-Day BOD	COD	SOLIDS				TOTAL KJELDAHL NITROGEN	PHOSPHATES		FLUORIDE	OIL & GREASE	PHENOL	CHROMIUM	COLIFORMS		HEAT Billion BTU/Day (At Full Capacity)
			Hours per Day	Days per Week	Mos. per Year			TOTAL	VOLATILE	TOTAL SUSP.	VOLATILE SUSP.		TOTAL PO_4	ORTHO PO_4					TOTAL No./Day	FECAL No./Day	
MISSISSIPPI RIVER																					
Mpls. Water Treatment Plant	858.9	2.3	24	7	12					11,000	1,800										
Riverside Power Plant	856.9	592.6[1]	24	7	12																80.1
Highbridge Power Plant	840.5	449.3[1]	24	7	12																74.2
Northwestern Refining Company	830.0	144	24	7	12	270	840	7,800	1,700	200	150	320	33			30	23		$>1.1 \times 10^{11}$	$>2.5 \times 10^{11}$	
General Dynamic Liq. Carb. Div.	824.2	0.70	24	5-7	12	17	38	3,300	1,200	200	150										
St. Paul Ammonia Products Company	824.2	0.66	24	7	12	80	290	14,000	2,600	110	<70	450	45			95	0.2				
Great Northern Oil Company	824.0	3.23	24	7	12	440	3,000	29,000	5,900	1,000	800	1,700	85			40	4.2		1.6×10^{12}	1.1×10^{12}	
NW Coop Mills (Pond Leakage) (Normal Eff.)	823.8		24	7	12	10 13	75 100	10,400 4,100	3,100 1,800	1,300 160	270 85	340 200	5,250 1,070	4,300 750	5[2] 150[2]				1.4×10^{12}	1.0×10^{11}	
Minnesota Mining & Mfg. Company	817.2	5.76	24	7	12	3,600	8,400	29,000	6,500	800	540	1,600	1,200	850	450		10		$>1.1 \times 10^{11}$	$>2.7 \times 10^{11}$	
Foot Tanning Co. (When Bypassing) (Normal Oper.)	792.8	1.03 1.03	18-24	6	12	2,800 1,500	9,100 4,200	61,000 49,000	13,300 4,700	10,600 500	5,000 300	290 240	212 46					120			
Red Wing Power Plant	789.4	53.9[1]	24	7	12																4.18
BLUE EARTH RIVER																					
Honeymead Products Company	0.6	4.3	24	7	12	2,100	2,800	25,000	6,200	860	720	120	250	100		600			1.5×10^{14}	5.1×10^{13}	
MINNESOTA RIVER																					
Blue Cross Rendering Company	105.5	0.094	15	6	12	700	1,300	1,570	680	480	240	72	23			120			$>3.7 \times 10^{13}$	$>3.4 \times 10^{13}$	
Wilmarth Power Plant	105.2	33.12[1]	24	7	12																5.1
Green Giant Co. (When Bypassing) (Normal Oper.)	75.4	1.48 0.23	15	7	4	13,000 120	20,000 380	60,000 2,000	30,000 400	3,900 60	2,300 45	370 8	220 6	170 2					1.4×10^{15} 1.2×10^{13}	2.6×10^{14} 1.0×10^{13}	
Minnesota Valley Milk Processing (Before Trtmt.)	49.8	0.27	9-16	7	12	290	620	3,000	950	250	100	25	43						$>8.1 \times 10^{12}$	$>2.4 \times 10^{12}$	
American Crystal Sugar Company	27.7	7.0	24	7	4	38,000	59,000	590,000	80,000	44,800	9,600	740	400	160					2.2×10^{15}	5.6×10^{14}	
M. A. Gedney Co.	27.5	0.4	24	7	12		(Not discharging directly to stream, yet.)														
Rahr Malting Co.	25.4	2.0	24	7	12	5,000	11,730	80,000	10,000	600	<500	135							1.0×10^{15}	4.7×10^{12}	
Cargill, Inc.	13.4	3.32	24	7	12	700	1,900	17,000	3,400	900	500	140	250	110		70			$>4.2 \times 10^{13}$	$>2.5 \times 10^{12}$	
Blackdog Power Plant	7.5	371.5[1]	24	7	12																36.4[2]
ST. CROIX RIVER																					
Andersen Window Co.	20.2	0.45	8	5	12	15	45	1,000	200	55	30	8	14	2					$>2 \times 10^{10}$	$<1 \times 10^{9}$	
United Refrig. Co.	16.5	0.059	8	5-6	12	2		132	52	6	3		0					1.7			

1. Maximum rate of discharge.
2. When bypassing cooling pond.

EXCERPTS FROM

"RECOMMENDATIONS FOR MINIMUM PERSONNEL, LABORATORY CONTROL AND RECORDS FOR MUNICIPAL WASTE TREATMENT WORKS"

BY

THE CONFERENCE OF STATE SANITARY ENGINEERS

IN COOPERATION WITH

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

1963

PLANT CAPACITY 0.25 MGD

LABORATORY CONTROL

In a plant of this size, the operator should conduct the following tests:

(1) Settleable solids (Imhoff Cone) once or twice a week using grab samples. The grab samples should be taken at a time of representative flow and should reflect varying days of the week and hours of the day.

(2) Relative stability (methylene blue) daily, Monday through Friday.

(3) Chlorine residual of effluent daily, Monday through Friday; twice daily when stream conditions require.

(4) For activated sludge plants, in addition to the above tests, sludge index tests daily and a colorimetric dissolved oxygen test weekly.

RECORDS

Usually personnel and time limitations will permit the keeping of only minimal records. However, two types of records should be kept: (1) a diary-type log showing a necessarily wide variety of useful and important information such as unusual maintenance work, failure of a piece of equipment, accidents, unusual weather, flooding, bypassing, complaints, visitors, etc.; and (2) a tabular record showing the observation or results of each laboratory test made and other available measured data such as plant flow, volume of sludge, or time sludge pumped. Emphasis is placed here on the need for the operator to record the data available to him with strict regularity and in a form best suited to his schedule.

PLANT CAPACITY 0.5 MGD

LABORATORY CONTROL

For a plant other than activated sludge the following tests should be conducted:

(1) Settleable solids (Imhoff Cone) daily, Monday through Friday. Tests should be made at varying hours during the day.

(2) Relative stability (methylene blue) daily, Monday through Friday. Tests should be made at varying hours during the day.

(3) Colorimetric pH of raw waste water occasionally.

(4) Chlorine residual of effluent daily; twice daily when stream conditions require.

(5) Total solids of digested sludge occasionally and when sludge is drawn to the drying beds.

(6) pH of digested sludge occasionally and when the sludge is drawn to the drying beds.

For an activated sludge plant the following tests should be conducted:

(1) Settleable solids (Imhoff Cone) daily.

(2) Relative stability (methylene blue) daily.

(3) Sludge index daily.

(4) Mixed liquor dissolved oxygen (colorimetrically) daily.

(5) Sludge depth measurements in primary and secondary settling tanks daily.

(6) pH of digested sludge when sludge is drawn.

(7) Total solids of digested sludge when sludge is drawn.

RECORDS

A diary should be kept similar to the 0.25 MGD plant, but with a full-time operator it should be more comprehensive. Regularity is emphasized.

The laboratory control record also is slightly more detailed because of the additional tests specified and with a full-time operator should be maintained with ease. Consultation with State regulatory agency representatives, university personnel, and/or other experienced personnel, and attendance at short courses in his state will assist the operator to establish and maintain suitable records. These records should be accurate and complete for the items specified.

PLANT CAPACITY 1.0 MGD

LABORATORY CONTROL

For primary and trickling filter plants the following tests are specified:

(1) Settleable solids (Imhoff Cone) daily.

(2) Relative stability (methylene blue) daily.

(3) BOD's of raw waste, final effluent, and of such other components as possible once a week and preferably twice a week. Samples should be

3-hour composites taken at 11 a.m., 12 noon, and 1 p.m.

(4) Suspended solids of raw waste, final effluent and of such other components as possible once a week and preferably twice a week.. Samples should be 3-hour composites taken at 11 a.m., 12 noon, and 1 p.m.

(5) pH of digested sludge when drawn or when operating difficulties are experienced or anticipated.

(6) Total solids of digested sludge when drawn or when operating difficulties are experienced or anticipated.

(7) DO of receiving stream at least twice a week above and below the plant discharge.

(8) Chlorine residuals of effluent daily; twice daily, when stream conditions require.

For activated sludge plants the following tests are specified:

(1) Settleable solids (Imhoff Cone) daily.

(2) Relative stability (methylene blue) daily.

(3) BOD's of raw waste, final effluent, and of such other components as possible twice a week. Samples should be 3-hour composites taken at 11 a.m., 12 noon, and 1 p.m.

(4) Suspended solids of raw waste, mixed liquor, and final effluent once a week. Samples should be 3-hour composites taken at 11 a.m., 12 noon, and 1 p.m.

(5) pH of digested sludge when drawn or when operating difficulties are experienced or anticipated.

(6) Total solids of digested sludge when drawn or when operating difficulties are experienced or anticipated.

(7) Depth of sludge in primary and final settling tanks daily.

(8) Sludge index daily.

(9) Dissolved oxygen (colorimetric) of mixed liquor daily.

(10) DO of receiving stream at least twice a week above and below the plant discharge.

(11) Chlorine residual of effluent daily; twice daily, when stream conditions require.

RECORDS

For a plant of this size considerable care and technical competence is required in assembling and recording the data. Included in the supervision be the understanding and patience needed to interpret the control procedure carried on. To establish and maintain adequate records, some guidance will be needed from state regulatory agency representatives, university personnel, and/or other experienced individuals.

PLANT CAPACITY 5.0 MGD

LABORATORY CONTROL

Following are recommended test procedures for plants other than activated sludge:

(1) Settleable solids daily.

(2) Relative stability daily.

(3) Dissolved oxygen of raw waste, effluent and receiving stream above and below the plant discharge 5 days per week.

(4) pH of raw waste and effluent 5 days per week.

(5) BOD's of raw waste and effluents 3 times per week on 24-hour composite samples.

(6) Suspended solids of raw waste and effluents 3 times per week on 24-hour composite samples.

(7) ph of digested sludge when drawn or as necessary to control digester operation.

(8) Total and volatile solids of digested sludge when drawn or as necessary to control digester

operation.

(9) Volatile acids of digested sludge when drawn or as necessary to control digester operation.

(10) Chlorine residual of effluent daily, twice daily when stream conditions require.

For activated sludge plants the recommended test procedures are as follows:

(1) Settleable solids daily.

(2) Relative stability or nitrates 5 days per week on 24-hour composite samples.

(3) Dissolved oxygen of raw waste, effluent and receiving stream above and below discharge 5 days per week.

(4) pH of raw waste and final effluent daily.

(5) BOD's of raw waste and effluents 5 days per week on 24-hour composites.

(6) Suspended solids of raw waste and effluents 5 days per week on composite samples.

(7) Sludge index daily on each shift.

(8) Mixed liquor DO (colorimetric) daily on each shift.

(9) Sludge depth in primary and final settling tanks daily on each shift.

(10) pH of digested sludge when drawn or as needed to

control digester operation.

(11) Total and volatile solids of digested sludge when drawn or as needed to control digester operation.

(12) Volatile acids of digested sludge when drawn or as needed to control digester operation.

(13) Chlorine residual of effluent daily, twice daily when stream conditions require.

RECORDS

The size of this plant makes it desirable to keep daily records of all operations - many of them on a shift basis. With a full-time superintendent and a staff of trained men, including a chemist in an activated sludge plant, there should be no difficulty in maintaining the records in a highly competent manner. The specified personnel should assure the interpretation and use of the control information in such a way as to obtain the maximum treatment efficiency.

Since this falls in the large plant category there may be considerable flexibility in the form of records and various control procedures. In addition to the recorded laboratory control and diary-type log information, this plant may need to record a number of other determinations.

Some of these might include alkalinity, ORP, heavy metals, or certain components indicative of particular industrial waste problems.

There are frequent needs to record other information which contributes markedly to the control procedure. Some of these data include the following:

(1) Weather and wind direction in the event of odor problems.

(2) In addition to the raw waste flow, a record of bypassing.

(3) Amount of course solids handled; i.e., grit screening, dried sludge hauled from beds, or sludge removal from digesters.

(4) Primary and secondary settling tank cleanup - hours of hosing or skimming and/or maintenance, etc.

(5) Trickling filter maintenance - nozzle cleaning, dosing or recirculating pump operation, humus sludge pumping to primary tanks, etc.

(6) Activated sludge operation - air volume and blower operation, volume of sludge return and waste, replacement or cleaning diffusers, etc.

(7) Sludge handling - in addition to volume of sludge pumped and time, such information as amount of recirculation or transfer of digested sludge, gas

mixing, supernatant withdrawal, final sludge to drying beds or filters, disposal of sludge from beds, conditioning chemicals for filters, incineration, etc.

Records of the above operations may be kept in a form most convenient to the superintendent. Because of the wide variation in plants of this size and individual needs, the way these records are kept will vary considerably.

PLANT CAPACITY 10.0 MGD

(Or larger)*

(*Note enclosed in parentheses has been added by the Twin Cities-Upper Mississippi River Project.)

LABORATORY CONTROL

Required test procedures for plants other than activated sludge are:

(1) Settleable solids daily.

(2) Relative stability daily.

(3) Dissolved oxygen of raw waste, effluent and receiving stream above and below discharge 5 days per week.

(4) pH of raw waste and effluent daily.

(5) BOD's of raw waste and effluents daily, Monday

through Friday, based on 24-hour composite samples.

(6) Suspended solids of raw waste and effluents daily, Monday through Friday, based on 24-hour composite samples.

(7) pH of digested sludge when drawn or as needed to control digester operation.

(8) Total and volatile solids of digested sludge when drawn or as needed to control digester operation.

(9) Volatile acids of digested sludge when drawn or as needed to control digester operation.

(10) Chlorine residuals of effluent daily, twice daily when stream conditions require.

For an activated sludge plant the required test procedures are:

(1) Settleable solids daily.

(2) Relative stability or nitrates daily on 24-hour composite samples.

(3) Dissolved oxygen of raw waste, final effluent and receiving stream above and below discharge 5 days per week.

(4) pH of raw waste and final effluent daily.

(5) BOD's of raw waste and effluents daily, Monday

through Friday, on 24-hour composite samples.

(6) Suspended solids of raw waste and final effluents daily, Monday through Friday, on 24-hour composite samples.

(7) Sludge index daily on each shift. Solids should be determined in conjunction with the BOD and suspended solids determinations.

(8) Mixed liquor DO (colorimetric) daily on each shift.

(9) Sludge depth in primary and final settling tanks daily on each shift.

(10) pH of digested sludge when drawn or as needed to control digester operation.

(11) Total and volatile solids of digested sludge when drawn or as needed to control digester operation.

(12) Volatile acids of digested sludge when drawn or as needed to control digester operation.

(13) Chlorine residual of effluent daily, twice daily when stream conditions require.

RECORDS

The comments on records for the 5.0 MGD plant also apply to the 10.0 MGD plant. The administrative personnel should select the record style best suited to their specific needs. Many more items of control data also may be desirable, based on the superintendent's judgment and on special conditions.

With a larger staff the 10.0 MGD plant may be able to carry on special projects beyond that possible in the smaller plants. Such projects may include special studies on industrial wastes or operational research projects. These projects may result in published information which can be valuable to many others with similar problems.

A plant of this size normally is expected to produce an annual operating report containing comprehensive records of the year's activities and performance. This procedure enables the superintendent to transform the daily records into summary and unusual information which is quite helpful to others.

(The document entitled "A Report on Pollution of the Upper Mississippi River and Major Tributaries" is on file as Exhibit 1 at the offices of the Federal Water Pollution Control Administration.)

MR. STEIN: Mr. Printz?

MR. PRINTZ: Mr. Chairman, I might also add that a limited number of copies of the larger report have been reproduced for selective distribution to those agencies or persons having a need for more detailed facts and information than are presented in the summary report. Individual copies of this report will be available upon written request to our offices at the U. S. Naval Air Station here in Minneapolis. It is expected, however, that the report entered into the record will serve the need of most of the people here present.

INTRODUCTION

The investigation of water pollution along the upper Mississippi River and its major tributaries was conducted by the Twin Cities-Upper Mississippi River Project of the Federal Water Pollution Control Administration. The investigation was made under the authority of Section 10 (d) (1) of the Federal Water Pollution Control Act, as amended.

The investigation was conducted to gather information on water quality, sources and quantities of wastes, the extent of pollution, and necessary abatement measures for the Mississippi River from the Rum River at Anoka, 107 miles downstream to the outlet of Lake Pepin; the lower 110 miles of the Minnesota River; and the lower 52 miles of the St. Croix

River.

Surveys of municipal and industrial waste sources were joint efforts of the Project, the appropriate regulatory agencies of the States involved, and in many instances the municipality or industry involved.

All desired information on waste sources and stream quality, collected over the years by the Minnesota Department of Health, Wisconsin Department of Health, and the Minneapolis-St. Paul Sanitary District was made available to the Project upon request.

To add a bit more to this, we might say that each of the States was extremely cooperative, and gave a great deal of assistance to the municipalities and the industries. I believe on every occasion on which the Project visited industrial waste sources, we were accompanied by a member of the Minnesota Department of Health, one of their engineers, if this source happened to be in Minnesota. On many other occasions, such as on stream sampling or time and travel studies, we had the fortune of having some of the State people along with us to give us assistance.

Manpower is not always as available in the Federal Government as many people seem to think it is.

Each of the two States, along with many other distinguished citizens around the area and from the States, participated as members of our Project Committee. So though only a few meetings were held of this committee, they were informed of the activities by weekly activity reports, and this served a great purpose in that the States were fully aware of what we were doing, what progress was being made, and could report it to their various constituents.

All laboratory procedures were performed in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater."

I might add here, there were several cooperative studies between the Project, the Minneapolis Department of Health, and also the Minneapolis-St. Paul Sanitary District laboratories.

All calculations (except those on flow frequencies) were based on data collected between June 1964 - October 1965 and reflect conditions resulting from waste loadings being discharged during that period.

WATER USES

The waters in the study area are used for a wide range of purposes regardless of the suitability of the water quality for these uses. The zones of extensive utilization of the waters for the identified uses are summarized on Figures 2 through 7 of the summary report.

We do not have slides to present these. I think everybody can look at the figures where these are delineated.

These uses included those for public water supply, nonpotable industrial process water, cooling water, hydroelectric power, irrigation and stock watering, commercial shipping, sport and commercial fishing, swimming and water skiing, pleasure boating, maintenance of habitat for aquatic life and water fowl, esthetic enjoyment and waste disposal. Isolated uses, however, do occur in some zones not shown in these figures.

SUMMARY OF WASTE SOURCES

The numerous sources of waste in the study area were investigated to determine the waste characteristics as well as the quantities being discharged. These data, when combined with the characteristics of the rivers themselves, provided the basis for determining future effects and abatement needs.

Mississippi River

On the Mississippi River, five primary and seven secondary municipal sewage treatment plants discharging 208 mgd of waste were investigated. At the time of the survey these sources contributed the following loadings of constituents:

Oxygen-consuming wastes equivalent to raw sewage from a population of 1,800,000 people.

Coliform bacteria equivalent to raw sewage from a population of 1,200,000 people.

Suspended solids equivalent to raw sewage from a population of 920,000.

Approximately 42,000 pounds of organic and ammonia nitrogen compounds per day.

Approximately 24,000 pounds of phosphates per day.

Approximately 850 pounds of phenols per day, and other miscellaneous constituents.

The Minneapolis-St. Paul Sanitary District sewage treatment plant is the largest waste source and contributes 91 percent of the municipal wastes volume. Of the total municipal contribution throughout the entire study area, the District's waste effluent contained 88 percent of the oxygen consuming materials; 95 percent of the coliforms; 92 percent of the suspended solids; 85 percent of the organic nitrogen, ammonia nitrogen, and phosphates; and essentially 100 percent of the phenols.

The South St. Paul sewage treatment plant is the second largest waste source and contributes 7 percent of the municipal wastes volume to the Mississippi River.

Also investigated on the Mississippi River were 14 manufacturing and processing plants, two water treatment plants, three steam-electric generating plants, and two barge washing facilities. These industrial sources, excluding the three electric plants, discharge waste at a rate of about 35,000,000 gallons per day to the river. The steam-electric plant utilizes as much as 1,095 mgd for river water for cooling purposes, returning it directly to the river after use. These sources together contributed the following loadings of constituents:

> Oxygen consuming wastes equivalent to raw sewage from a population of 35,000.
>
> Suspended solids equivalent to raw sewage from a population of 70,000.
>
> Approximately 4,500 pounds of organic and ammonia nitrogen compounds per day.
>
> Approximately 2,500 pounds of phosphates per day.
>
> Approximately 160 billion British Thermal Units (BTU) of heat per day (during the time when

steam-electric plants are operating at full capacity.

Approximately 600 pounds of fluoride per day.

Approximately 40 pounds of phenols per day.

Coliform bacteria equivalent to raw sewage from a population of 170.

Tables 2 through 5 summarize the information contained on the characteristics of waste from all the municipal and industrial sources investigated as well as the loading rates of the various constituents discharged from each plant to the rivers.

The Cities of Minneapolis, St. Paul, and South St. Paul each have combined sewers with regulators that divert excess flows directly to the Mississippi River.

The Minneapolis-St. Paul combined sewer system has more than 80 overflow points. Discharges from these points represent about 7.5 million pounds of 5-day (20°C) BOD and 9.5 million pounds of suspended solids on a yearly basis. This overflow occurs over about 10 percent of the time in a given year. South St. Paul, however, has a more serious surcharging problem along a considerable portion of the interceptor during periods of maximum dry-weather flow. It is estimated that South St. Paul's overflow system contributes about 6 million pounds of 5-day (20°C) BOD and 5 million pounds of suspended solids on a yearly basis.

Minnesota River

On the Minnesota River, seven communities, one institution, eleven manufacturing and processing plants, two steam electric generating plants, and two barge cleaning facilities, discharged to the river. At the time of the survey, these sources altogether contributed the following loadings of constituents:

1. Oxygen consuming wastes equivalent to raw sewage from a population of 297,600.

2. Coliform bacteria equivalent to raw sewage from a population of 52,800.

3. Suspended solids equivalent to raw sewage from a population of 257,300.

4. Approximately 2,050 pounds of organic and ammonia nitrogen per day.

5. Approximately 1,500 pounds of phosphates per day.

6. Approximately 740 pounds of oil and grease per day.

7. And again during the time when the steam-electric plants are operating at full capacity and discharging cooling water directly to river,

approximately 60 billion BTU of heat per day.

St. Croix River

Discharges to the St. Croix River come from six communities and two industries. At the time of the survey, combined loadings of constituents were discharged to the river equal to:

1. Oxygen consuming wastes equivalent to raw sewage from a population of 9,730.
2. Coliform bacteria equivalent to raw sewage from a population of 1,600.
3. Suspended solids equivalent to raw sewage from a population of 7,300.
4. Approximately 400 pounds of organic and ammonia nitrogen per day and 500 pounds of phosphates per day.

Nutrients entering the study area are most significant during the month of August. It is estimated that total nitrogen and phosphates enter the waters of the study area from agricultural and natural sources in the following amounts:

Mississippi River above Lake Pepin --

40,000 pounds/day total nitrogen

20,000 pounds/day phosphate

A. C. Printz, Jr.

Minnesota River -- 6,000 pounds/day total nitrogen
4,000 pounds/day phosphate

St. Croix River -- 13,000 pounds/day total nitrogen
2,000 pounds/day phosphate

IMPAIRMENT OF USES

The typical water quality conditions which existed during the low flow periods of 1964 and 1965 are well defined in Figure 12 of the summary report. An examination of this figure will show the ranges of dissolved oxygen throughout the study area. These were actual levels and not projections to the 7-consecutive-day, once-in-10-year low flow. Also depicted are the total coliform contents of the rivers and the reaches of lowest fish palatability.

In Figures 8 through 13 of your report the uses of the river which were impaired because of existing water quality are revealed by river reach. Comparison of these figures with the earlier ones numbered 2 through 7 will relate the areas where uses were practiced even though the existing water quality was unsatisfactory for various reasons, these being either chemical, biological or bacteriological in nature.

The figures on these two pages are organized in such a manner that with the exception of the bottom two on Page 2, I believe you will be able to compare the two sets of figures.

Specific attention is directed to the uses of the waters for both whole body and limited body contact activities.

From these you will get an idea of where these uses were practiced, and where the water quality was not satisfactory for that practice.

Included within Pages 13 through 20 in the summary report are the details of the levels of existing water quality in the various reaches of the rivers. We won't go into detail of what these things are. However, examples of what may be found within this reach are such things as levels of dissolved oxygen; levels of other chemical constituents, e.g., phenols, ammonia nitrogen; bacteriological levels, e.g., total coliform, fecal coliform, pathogenic bacteria, and viruses; existing biological conditions, e.g., species of fish, bottom conditions, algal densities and related indicators of water quality; and also the levels of constituents required to achieve a water quality suitable for various uses.

CONCLUSIONS

It can be concluded from the investigations, that sewage and industrial wastes discharged to the Mississippi River from Minnesota cause pollution in the interstate waters of the Mississippi River which endangers the health and welfare of persons in Wisconsin and, therefore, is subject to abatement under the provisions of the Federal Water Pollution Control Act.

During the period of study, the staff investigated a total of 33 sources of wastes to the Mississippi River, 21 sources to the Minnesota River, and eight to the St. Croix River. These sources are listed on pages 23 and 24 of the summary report. In total, there were 62 individual sources of waste that were investigated.

A detailed synopsis of conditions found during the survey is presented on pages 24 and 25. Highlights of these findings include:

1. The lowering of the DO level to below 3.0 mg/1 on 21.1 miles of the Mississippi River during the summer of 1964 and the winter of 1964-1965.

Mr. Bryson did point out the 21.1 miles of the Mississippi River. The dissolved oxygen level was also lowered to below 3.0 milligrams per liter on 27.7 miles of the Minnesota River during the 1964-1965 winter.

2. You will also find that pages 24 and 25 will point out the exceeding of the average concentrations

of inorganic nitrogen levels of 0.3 mg/l and 0.03 mg/l of phosphorus throughout the three major rivers under study.

3. The average coliform densities exceeded 5,000/100 ml during all surveys in 70 miles of the Mississippi River and in 109 miles of the Minnesota River.

Our map only shows the Minnesota River from the community of LeSueur. We extend the study area farther up the Minnesota River to the area of Mankato.

4. The detectable presence of pathogenic bacteria and enteric viruses in the 10 miles of Mississippi River below the M.S.S.D. outfall and immediately below the Red Wing sewage treatment plant.

5. Also the reaching of nuisance conditions due to algal bloom in shallow areas along the shorelines of both Lake Pepin and Lake St. Croix.

6. Also the presence of bottom sediments consisting almost solely of organic sludge in 21.1 miles of the Mississippi River and in all of Lake Pepin during 1964.

One other thing that ought to be pointed out on the map is the area entitled or called "Spring Lake." This is mentioned in your report. However, we did neglect to put Spring Lake on the map in your report, so for those of you who don't know where Spring Lake is, Mr. Bryson has just pointed it out to you.

A. C. Printz, Jr.

RECOMMENDATIONS

The recommendations to the conferees relate to the remedial measures necessary to preserve or upgrade existing water quality to permit maximum usage of the waters within the study area.

The recommendations are given in two groups, as Mr. Stein earlier pointed out: General and specific. General recommendations cover the broad objectives of pollution abatement in the Project area. Specific recommendations are given for the solution of particular problems and are offered in addition to, and not in place of, the general recommendations. These recommendations apply to problems in need of immediate attention and are not to be construed as being long-range objectives of a comprehensive water resource development program for the Upper Mississippi River Basin. These recommendations are applicable to the 62 waste sources listed on pages 23 and 24 of the summary report.

Relative to general recommendations for municipalities, institutions and industries:

1. It is recommended that there be no further decrease in quality of any of the waters within the study area as previously defined.

A. C. Printz, Jr.

2. It is recommended that water quality be enhanced as stipulated in the remaining recommendations to provide the following dissolved oxygen and coliform levels in the given segments of the Mississippi, Minnesota and St. Croix Rivers during flows equal to or greater than the 7-consecutive-day, once-in-10-year summer and winter low flows:

I will refer to various coliform guides in this next section. These are well defined in the text and will not be mentioned here.

RIVER SEGMENT		(MAXIMUM OR MINIMUM CONCENTRATIONS FOR ANY ONE SAMPLE)	
FROM (RIVER MILE)	TO (RIVER MILE)	DO (Min.) mg/l	COLIFORM GUIDE (Maximum)[1]
Mississippi River			
871.6 (Anoka)	836.3 (MSSD)	No deterioration in present level (7 5 mg/l)	A&C C applies to segment between Anoka and St. Anthony Falls
836.3 (MSSD)	815.2 (L&D No. 2)	3	B
815.2 (L&D No. 2)	763.5 (Chippewa River	5	A
Minnesota River			
109.2 (Mankato)	30.0 (Chaska)	No deterioration in present level (7 5 mg/l)	B
30.0 (Chaska)	0.0 (Mouth)	3	B
St. Croix River			
52.0 (St. Croix Falls)	0.0 (Mouth)	No deterioration in present level (7 5 mg/l)	A&C

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If these water quality conditions are assured, the various river segments will be suitable for the use delineated on page 28 of the Report and also depicted on the display in the lobby. The display, however, is not to be included within the published report.

Continuing with the general recommendations, all municipalities and other institutions discharging sewage to the rivers under investigation provide at least secondary biological treatment plus continuous disinfection of the effluent. This treatment is to produce an effluent containing no more than:

20 percent of the mass of 5-day BOD originally contained in the influent.

20 percent of the mass of suspended solids originally contained in the influent.

5,000 coliforms/100 ml (except where "d" applies).

1,000 coliforms/100 ml between May and October, inclusive, where receiving waters are used for whole body contact activities.

These limits are to be followed except where more stringent ones are given in the specific recommendations or are required by State water pollution control agencies.

Municipal waste treatment plants maintain at least the minimum laboratory control and records as recommended by the Conference of State Sanitary Engineers at their 38th Annual Meeting in 1963. In addition, all plants should maintain a record of chlorine feed rates and those plants of 2 million gallons per day capacity or greater should provide analyses for total and fecal coliforms on a once-per-week basis. Results of laboratory tests and other pertinent records should be summarized monthly and submitted to the appropriate State agency for review and evaluation. These records are to be maintained in open files of the State agency for use by all persons with a legitimate interest.

New waste treatment facilities be designed to provide adequate capacity of individual units and components as well as maximum flexibility in order to permit later modification in operating procedures so as to effect the greatest amount of phosphate removal. Existing plant facilities should be operated so as to optimize phosphate removal.

The States of Minnesota and Wisconsin establish a program of monitoring and surveillance in area waters for evaluating progress in improvement of stream quality resulting from implementation of actions recommended by the conferees. The Federal Water Pollution Control Administration should establish monitoring stations where appropriate on portions of the Mississippi and Minnesota Rivers within the State of

Minnesota to aid in the evaluation. Water quality surveillance activities should be coordinated and all information made available to the States, the Federal Water Pollution Control Administration, and other parties with a legitimate interest.

All present and future sewerage and sewage treatment facilities be modified or designed and operated to eliminate bypassing of untreated wastes during normal maintenance and renovation operations. The appropriate State agency is to be contacted for approval prior to any expected bypassing of waste. All accidental or emergency bypassing or spillage should be reported immediately.

Wastes such as the lime sludge from St. Paul water treatment plant, which discharge into a municipal sewerage system, be pretreated to avoid any detrimental effect on waste treatment operation.

Programs be developed by those responsible for the facilities to prevent or minimize the adverse effect of accidental spills of oils, gases, fuels, and other material capable of causing pollution. The elements of such programs should include:

> Engineering works such as catchment areas, relief vessels, and dikes to trap spillage.
>
> Removal of all spilled materials in a manner acceptable to the regulatory agencies.

A. C. Printz, Jr.

Immediate reporting (by those responsible for the facilities) of any spills to the appropriate State agency.

In-plant surveys and programs to prevent accidental spills.

Combined storm and sanitary sewers be prohibited in all newly developed areas and be eliminated in existing areas wherever opportunity to do so is afforded by redevelopment. Present combined sewers should be continuously patrolled and operated so as to convey the maximum possible amount of combined flows to and through the waste treatment plant. In addition, studies to develop effective control of wastes from this source should be continued by the MSSD and should be initiated by the City of South St. Paul. Although the immediate problem is a bacterial one, both studies should also consider the discharge of BOD and solids. Methods to be used to control wastes from combined sewers and a time schedule for their accomplishment should be reported to the conferees within two years after issuance of the Conference Summary.

All industries discharging wastes to the rivers under investigation, unless otherwise specified, provide treatment sufficient to produce an effluent containing no more than 20 percent of the mass of 5-day (20°C) BOD and suspended solids originally contained in the untreated process waste. Settleable solids and coliforms in the effluent are not to exceed the following:

Settleable solids - 5 ml/l

Coliforms - 5,000/100 ml (except where "c" applies)

Coliforms - 1,000/100 ml between May and October, inclusive, where receiving waters are used for whole body contact activities.

Industries discharging wastes to the waters maintain operating records containing information on waste discharge rates and concentrations of constituents found in significant quantities in their wastes.

This information should be summarized and submitted to the appropriate State agency at monthly intervals for review and evaluation. These records are to be maintained in open files of the State agency for use by all persons with a legitimate interest.

All watercraft provide adequate treatment on board or arrange for suitable on-shore disposal of all liquid and solid wastes.

Garbage or refuse not be dumped along the banks of the river and no open dumps be allowed on the flood plain. Material in present dump sites along the river banks should be removed and the appearance of the bank restored to an esthetically acceptable condition. Present open dumps on the flood plain should be converted to sanitary landfills operated acceptably to the appropriate State agencies.

Waste sources upstream from and outside of the study area on the Mississippi, Minnesota and St. Croix Rivers and their tributaries be sufficiently controlled so that waters entering the study area conform to General Recommendation No. 2.

Specific Recommendations - Mississippi River

Again, these specific recommendations are offered in addition to, and not in place of, the general recommendations.

Municipal Sources

It is recommended that:

Maximum waste loadings from all sources between and including the Minneapolis-St. Paul Sanitary District and the South St. Paul Sewage Treatment Plants be such that a minimum dissolved oxygen content of 3.0 mg/l can be maintained during the 7-consecutive-day, once-in-10-year low summer flow in the reach of river between Mississippi River miles 836.4 and 815.2. To attain this, combined wastes loads from these sources should not exceed 68,500 pounds/day of 5-day BOD, exclusive of combined sewer overflows. Suspended solids loadings discharged to this reach (exclusive of combined sewer overflows) should not exceed 85,500 pounds/day in order to minimize sludge deposits.

Maximum loadings of phenolic wastes from the Minneapolis-St. Paul Sanitary District sewage treatment plant, Northwestern Refining Co., Great Northern Oil Co., and Minnesota Mining and Manufacturing Co., all combined, not exceed 110 pounds/day in order to maintain the stream concentration of this material under 0.01 mg/l at stream flows equal to or greater than the 7-consecutive-day, once-in-10-year low flow.

An engineering study of the Minneapolis-St. Paul Sanitary District sewerage system be undertaken to determine what changes are required to make unnecessary the practice of bypassing wastes periodically for the purpose of cleaning the interceptor transporting wastes to the plant.

The BOD removal efficiency at the Hastings, Minnesota primary sewage treatment plant be increased from the 5 percent figure found during the survey to a minimum of 30 percent until the secondary biological treatment facilities are in operation.

A. C. Printz, Jr.

Industrial Sources

It is recommended at the water treatment plants of the City of Minneapolis that:

Treatment facilities be provided capable of producing an effluent with a suspended solids concentration not exceeding that found in other treated effluents being discharged to the same reach of river. At no time should the daily average suspended solids concentration exceed 50 mg/1.

The industries in the South St. Paul area, Swift & Company, Armour & Company, and the St. Paul Union Stockyards, provide an effective method of control and correction of direct discharges to the Mississippi River. These include so-called clean waste waters, watering through overflows, truck washing wastes, surface drainage, and hog pen flushings. The coliform densities of any of these discharges should not exceed 5,000/100 ml once the control devices are in operation.

Additional treatment be provided at Northwest Cooperative Mills concentrations of the compositing pond effluent to substantially the same levels found in other effluents being discharged to the same reach of river after satisfactory treatment. In no instance should the daily average suspended solids concentration exceed 50 mg/1.

Any additional facilities constructed for the Foot Tanning Company's waste produce an effluent of a quality acceptable to the Minnesota Water Pollution Control Commission and in conformity with recommendations in this report. The possibility of discharging the settled waste to the Red Wing sewerage system in lieu of additional treatment should be considered and a report on the conclusions of such questions submitted to the MWPCC.

Specific Recommendations - Minnesota River

Industrial Sources

It is recommended that at the Green Giant Company an additional pump be provided for standby purposes at the waste water sump for use when the main pump fails. The sanitary and miscellaneous process wastes should be handled as specified by the General Recommendations.

Maximum waste loadings from all sources between and including the American Crystal Sugar Co. and the Rahr Malting Co. be such that a minimum dissolved oxygen content of 3.0 mg/1 can be maintained during the 7-consecutive-day, once-in-10-year low winter flow in the reach of river between Minnesota River miles 29 and 0. To attain this, combined waste loads from these sources should not exceed 12,000 pounds day of 5-day BOD during winter when there is no ice cover in the vicinity of the Blackdog power plant. At times of complete

A. C. Printz, Jr.

ice cover, the maximum waste loading of 5-day BOD from these sources should not exceed 6,500 pounds/day. In no case, however, should treatment efficiency be less than that specified in the General Recommendations.

A water temperature of not greater than 90°F be maintained in the lower Minnesota River. To attain this, the existing cooling pond at the Northern States Power Company Blackdog plant should be utilized to its fullest extent during the summer at stream flows less than 1500 cfs. During these periods the thermal addition to the Minnesota River should not exceed 13.5 billion BTU/day.

FEDERAL INSTALLATIONS

Although their contributions are small, full consideration is still given to Federal installations, in compliance with Section 11 of the Federal Water Pollution Control Act as amended.

General Recommendations

At U. S. Army Nike Missile Installations it is recommended that:

A minimum of one hour per day be devoted to proper treatment plant operation and maintenance.

The treatment facilities be operated such that removal efficiencies approach those for which the plants were designed.

Laboratory analyses and records maintenance consistent with recommendations of the Conference of State Sanitary Engineers for plants of 0.25 mgd capacity be carried out. A report of these functions, including results of analyses, is to be furnished to the Federal Water Pollution Control Administration upon request.

Specific Recommendations

Nike Site No. 40, Farmington, Minnesota

It is recommended that:

Discharge of effluent to the roadside ditch be terminated as soon as possible. The present outfall sewer line should be extended so as to discharge the effluent into the unnamed creek which at present ultimately receives the waste.

Continuous chlorination facilities be activated immediately with disinfection sufficient to produce a free chlorine residual of 0.5 mg/l after a 15-minute contact at peak flow rates.

A. C. Printz, Jr.

Nike Site No. 90, Bethel, Minnesota

It is recommended that continuous chlorination facilities be activated immediately with disinfection sufficient to produce a free chlorine residual of 0.5 mg/l after a 15-minute contact at peak flow rates.

U. S. Air Force - Air Defense Command

Osceola, Wisconsin Station

It is recommended that a schedule of maintenance practices be instituted consistent with accepted procedures for operation of oxidation ponds so as to insure satisfactory treatment.

U. S. Army Corps of Engineers

Locks and Dams

It is recommended that:

Present plans be continued concerning improvement or replacement of inadequately sized treatment facilities.

At stream flows of 7,000 cubic feet per second (cfs) or less (as measured at the St. Paul gage), as much water as possible be passed over bulkheads ahead of the Taintor gates at Lock & Dam No. 2. At flows of 3,000 cfs. or less, the equivalent of the inflow to Pool No. 2 should be passed over the bulkheads. The Corps has already agreed to continue

A. C. Printz, Jr.

this practice.

Floating Dredge Thompson

It is recommended that a planned schedule of analyses be continued on effluent from the waste treatment facilities so as to insure adequate removals prior to overboard discharge of effluent.

U. S. Air Force - 934th Troop Carrier Group

Officers Club

It is recommended that the present single compartment septic tank be changed to a two-compartment tank. A subsurface tile field of adequate size should be installed to supplement the present field.

SCHEDULE FOR REMEDIAL PROGRAM

MUNICIPALITIES, INSTITUTIONS, AND INDUSTRIES

The investigators have prepared a schedule for remedial action. The suggested time schedule periods should commence with the issuance of the Conference Summary by the Secretary of the Interior.

A. C. Printz, Jr.

a. Submission of preliminary plans for remedial facilities within 6 months.

b. Submission of final design for remedial facilities within 12 months.

c. Financing arrangements for municipalities completed and construction started within 18 months.

d. Construction completed and plants placed into operation within 36 months.

e. Existing schedules of the State agencies calling for earlier completion dates are to be met.

FEDERAL INSTALLATIONS

Schedules for Federal installations requiring only operational and maintenance changes shall be initiated immediately. Changes required at Nike Site No. 40 and the Ft. Snelling Officers Club should be completed and made operational within 6 months.

SCHEDULE MODIFICATIONS

It is recognized that modifications in this schedule may be necessary. These may include:

a. A lesser time where the control agency having jurisdiction considers that a practical method of control can be in operation prior to the time stated.

b. In a few industries and municipalities some variation from this schedule may be sought from the appropriate State and local pollution control agencies. In such cases after review the conferees may make appropriate recommendations to the Secretary of the Department of the Interior.

Mr. Chairman, this concludes the abridgement of the Summary and Pollution Abatement Recommendations Report for the Upper Mississippi River and Major Tributaries..

MR. STEIN: Thank you for a very comprehensive report, Mr. Printz. Are there any questions or comments?

MR. WISNIEWSKI: Mr. Chairman, I would suggest that we defer the questions or the comments until after lunch. It is 12 o'clock now.. I have a number of questions that would take considerable time.

MR. STEIN: All right. I think that is a fair request. We will recess until a quarter after one.

(Whereupon, at 12:00 noon, a luncheon recess was taken until 1:15 p.m. of the same day.)

AFTERNOON SESSION

(1:15 p.m.)

MR. STEIN: May we reconvene?

In the interests of saving time, and in deference to comity between the States -- what comity means I never quite understood myself -- we are going to reverse the alphabetical order. Wisconsin will go first. Wisconsin believes that it can save time by making its presentation first, and thus will avoid a lot of unnecessary questions. We will now turn the time over to Wisconsin. Wisconsin can proceed in its own way.

First, we will ask for any questions from Wisconsin, and then, of course, Wisconsin may make any statement it wishes.

Mr. Wisniewski?

MR. WISNIEWSKI: Thank you, Mr. Chairman.

Mr. Printz, on Page 19 of the report which was submitted as an exhibit and on which you briefed the information, in the right-hand column, in the second to the last paragraph, there is a statement that:

> "The waters in this segment below Chaska were unsuitable for irrigation, stock and wildlife watering, navigation, and limited body contact activities because the average coliform density

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exceeded 5,000 MPN/100 ml."

Was it intended that irrigation waters and navigation waters have coliform standards set on them?

MR. PRINTZ: Yes, it was, to this extent: The irrigation part does, Mr. Wisniewski, need, I think, some clarification, which was not included in the summary, but is included in the supplemental report on Page III-26, and going on to Page 27, and the table at III-22. It is in the larger part.

I might just refer you to my copy (handing same to Mr. Wisniewski).

It is intended at this point that the irrigation which we considered as a use being damaged because of the average coliform density, be clarified in that table with a footnote referring only to those products that are eaten raw and uncooked, so to this extent we did intend it to be a coliform guide, but it would relate to irrigation only in that sense.

Navigation, yes, because navigation we consider a limited body contact due to the contact which the boat operators come into with the water.

MR. WISNIEWSKI: Thank you.

Under the General Recommendations in the right-hand column, the last paragraph above the table, you indicate that no recommendations are made with reference to the fertilization of the rivers and backwater areas insofar as provision of specialized treatment facilities.

Is there a reason for this? Is this because we don't have the knowledge for application of adequate treatment facilities within economic practicability?

MR. PRINTZ: No, sir. We feel now that we do have that knowledge, but the reason for inclusion of this statement was the fact that we believe that proper operation and also operation consistent with the general guideline relating to phosphate removal, No. 5, will do a great deal to minimize this problem; but as far as knowing how to construct and operate plants, yes, the Administration feels we now have that knowledge and it can soon be made available to any consulting engineers that would desire that information.

MR. WISNIEWSKI: Well, we can't quite agree with operation plants in the north being similar to those in the southern part of the United States, and the experiments here show that you won't get the same results as you get in the Texas area on removal of phosphates by this process.

MR. STEIN: Ted, I'm with you.

This is just for clarification. In order that this record is going to be meaningful, what do we recommend for phosphates, specifically, when you say we have recommendations?

MR. PRINTZ: We have a recommendation that new waste treatment facilities be designed to provide adequate capacity of individual units and components, as well as maximum flexibility in order to permit later modification in operating procedures so as to effect the greatest amount of phosphate removal, and existing plant facilities should be operated so as to optimize phosphate removal.

MR. STEIN: All right.

Off the record.

(Discussion off the record.)

MR. STEIN: All right.

MR. WISNIEWSKI: What do you mean by "flexibility"?

MR. PRINTZ: Flexibility in the manner in which a plant can be manipulated, the different amounts of sludge returned, withheld, etc., so that when Mr. Wisniewski becomes convinced that something can be done in Wisconsin through the manipulation of a plant, that plant can be manipulated in the proper manner.

MR. STEIN: I think I understand what you are saying.

Are you satisfied with that, Ted?

MR. WISNIEWSKI: Not completely. This is something that has to be studied more thoroughly, because it is inadvisable to build a lot of extra capacity if you don't need it, if there is another approach to the problem.

I think this matter of removal of fertilizer elements should receive more research and be supported by Federal funds.

MR. PRINTZ: To that extent, I would like to say that there will be a phosphate removal demonstration study at Detroit, Michigan, and I believe the results obtained there would apply to the State of Wisconsin.

There are going to be at least three studies in the country. The portion for the Midwest will be at Detroit. Federal funds are going into the studies.

MR. WISNIEWSKI: On Page 29, in the left-hand column under "Treatment of Municipal Wastes," you indicate certain limiting concentrations that will need to be present in the effluent as discharged, such as 20 percent of the mass of 5-day BOD originally contained in the influent, and so on, for the other parameters.

What provision is being made to take care of growth in the community? For example, if we keep taking 20 percent out and later on we double the population over a period of years, we have actually increased the amount of pollution going into the stream using this as a basis.

MR. PRINTZ: I believe I emphasized -- at least, I intended to emphasize at the beginning of my verbal statement, if I can be permitted to check my notes here, the fact is that these are what we feel are solutions to the immediate problems and are not to be considered as long-range objectives or a part of the overall comprehensive program.

We believe that this will take care of the immediate problems in all cases where the general recommendations apply, recognizing, of course, that as the States establish their criteria and standards on intrastate waters in compliance with the Water Quality Act of 1965, they will be cognizant of this and will take that into consideration. But these were intended to be the degrees of treatment to meet the immediate needs.

MR. WISNIEWSKI: On that same page, under Item 6, "Monitoring of Water Quality," it refers to the fact that the Federal Water Pollution Control Administration should establish monitoring stations where appropriate on portions of the Mississippi and Minnesota Rivers within the State of Minnesota to aid in the evaluation.

There is no such offer made to Wisconsin under this subject of "Monitoring of Water Quality." In fact, you suggest that both Minnesota and Wisconsin establish monitoring and surveillance stations, but then you offer your assistance to the State of Minnesota, but not to the State of Wisconsin.

(Laughter.)

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MR. PRINTZ: I must admit, sir, it is somewhat discriminatory, as read.

A bit of background information, perhaps: A necessary part, we feel, of each enforcement action to meet the abatement conditions recommended is the establishment of a surveillance program to make sure that the job as called for is being done.

To this extent, the Federal Water Pollution Control Administration has already expended approximately $36,000 to establish three automatic monitoring stations within the study area. The locations of these stations, unfortunately for Wisconsin, are all located within the State of Minnesota. The reason is that we felt the particular locations selected would have to be in Minnesota in order to accomplish what we desired.

I assure you, however, the Federal Government will cooperate with Wisconsin in any monitoring program.

I might point out, as I see Mr. Stein looking at me somewhat quizzically, the uppermost station will be on the Mississippi River at the Northern States Power Company's Riverside Plant for the purpose of monitoring water in that upper reach. We feel that this location is very representative of water in that area.

The second station will be located on the lower

Minnesota River at approximately Mile Point 8. This is in the vicinity of the new airport approach bridge across the Minnesota River. I believe it is Mile Point 3 instead of Mile Point 8. Excuse me.

The third station will be located farther downstream on the Mississippi River at the site of the Shiely Sand and Gravel operations.

The Minnesota River and the Mississippi River stations are located within the flood plain, and hence are going to be housed in trailer units, so that they can be moved out during the flood periods. Data from these stations will be telemetered back to the Project headquarters, where there will be a continuous reporting of four parameters looking to the characterization of that water. These will be dissolved oxygen, pH, temperature and conductivity.

These data, when collected, will be made available to the States. They will be entered into the Administration program for the storage of data and will be available to others that have need for this.

MR. STEIN: I wonder if we may clarify this.

The establishment of parameters I think is a technical operation and it might be left up to the technical committee.

What we have heard described within the State of

Minnesota really is necessary for an appropriate monitoring system -- "where appropriate on portions of the Mississippi River and the Minnesota River," "to aid in the evaluation." I don't know, but it may be wise to put something down below the confluence at the State border on the Mississippi. In the recommendations you were talking in terms of evaluations, and you might propose as much flexibility in this as you propose with reference to the handling of phosphates.

Why do we have to come to this conclusion now?

Is this all right?

MR. WISNIEWSKI: It might be advisable to have a monitoring station below the new power plant on the St. Croix.

MR. STEIN: That is right.

How would it hurt the recommendation if we struck that phrase, "within the State of Minnesota"?

If your three stations are valid here in the locations that you mentioned, I don't think we or Wisconsin or Minnesota will object to these points, but the limitation of placing this within the State seems to me possibly to cut off flexibility on where you could establish monitoring stations.

MR. PRINTZ: The reason it was cut off in this respect is that we feel the primary responsibility of the surveillance lies with the State, and this is an added help here to the States.

MR. STEIN: I understand that.

Let me read this again. What you say is:

> "The Federal Water Pollution Control Administration should establish monitoring stations where appropriate on portions of the Mississippi and Minnesota Rivers,"

and then you say,

> "within the State of Minnesota to aid in the evaluation."

If our purpose is to help in the evaluation, how would it hurt if we dropped that phrase and said,

> "The Federal Water Pollution Control Administration should establish monitoring stations where appropriate on portions of the Mississippi, Minnesota and St. Croix Rivers"?

MR. PRINTZ: We could refine it by saying, "within the study area."

MR. STEIN: That is right. Give yourself the flexibility here.

Let's go off the record a minute.

(Discussion off the record.)

MR. STEIN: Back on the record.

Don't you think that would be better if we gave ourselves that flexibility?

MR. PRINTZ: It would provide more flexibility.

MR. STEIN: Yes.

MR. WISNIEWSKI: The next item is on Page 30. At the top you cover combination storm and sanitary sewers and indicate means of doing some control work on them.

However, there is no specific reference to storm waters alone, and there is a feeling developing throughout the country at the present time that we may have to treat storm waters in order to protect our receiving streams.

Has any consideration been given in the study to the storm water problem exclusive of the sewer problem?

MR. PRINTZ: We agree with you that this is a problem of growing concern, and it will become more so when the combined sewer problem is taken care of.

However, once again, in determining the immediate abatement needs, this did not appear to be one that could be taken care of adequately or economically at this time, but we would hope that the two States again would look to this, perhaps in their implementation plans in connection with the water quality standards as a long-range problem, or a problem that could be taken care of perhaps within the next ten-year period.

MR. WISNIEWSKI: On that same page, in the right-hand column under "Garbage and Refuse Dumps," you state:

> "Garbage or refuse not be dumped along the banks of the river and no open dumps be allowed on the flood plain. Material in present dump sites along the river banks should be removed and the appearance of the bank restored to an esthetically acceptable condition."

So far so good.

> "Present open dumps on the flood plain should be converted to sanitary land fills operated acceptably to the appropriate State agencies."

In Wisconsin we have Section 1440445 in an area where the dump would be subject to inundation as a result of periodic flooding, or might be washed into a surface water. This in effect means to us that we could not even locate a sanitary land fill in a flood plain.

Is it your opinion that changing a dump to a sanitary land fill would afford sufficient protection so that you could keep the sanitary land fill in the flood plain?

MR. PRINTZ: No, sir, but it is very commendable that the State of Wisconsin has recognized that, and it is for that reason that additional wording was put in to the effect that if it should be converted, it should be operated acceptably to the appropriate State agencies.

In this case, Wisconsin, of course, would not allow the location of it, and, Dr. Hargraves, you might clarify this point, but I don't believe Minnesota has such legislation or does prohibit them at this time from the flood plains. Hence the converting would be the next-best step.

DR. HARGRAVES: We will comment on that later, because we have a four-page legislative report, let us say, that takes care of it.

MR. PRINTZ: All right.

MR. STEIN: Do you propose a dump on the flood plain?

MR. PRINTZ: No, we don't.

MR. STEIN: Then why do you recommend against it if you think that the Wisconsin statute position is solid?

I have been in this business, I think, as long as most people. Just to prolong this a bit, what is the difference between a dump and a sanitary land fill?

MR. PRINTZ: We would be very much opposed to anything of this nature within the flood plain.

MR. STEIN: You don't want to answer the question. You know, a sanitary land fill reminds me of the Holy Roman Empire. They always said it was neither holy, nor Roman, nor an empire, and I don't know the difference between a dump and a sanitary land fill, because I have found very few of those which were sanitary or land, or really a fill.

However, if the Wisconsin position is solid and there should not be any dumps or land fills on the flood plain, why can't we adopt that as a recommendation?

MR. PRINTZ: That would be agreeable with the investigators.

MR. STEIN: All right. Ted?

MR. WISNIEWSKI: Now I would like to comment about the conclusions. This reads:

> "Sewage and industrial wastes discharged to the Mississippi River from Minnesota cause pollution in the interstate waters of the Mississippi River which endangers the health and welfare of persons in Wisconsin and, therefore, is subject to abatement under the provisions of the Federal Water Pollution Control Act."

We feel complimented that there is no such thing with reference to Wisconsin in this report.

Then we go to Page 34 --

MR. STEIN: Ted, would you talk up a little bit for the Minnesota delegation?

MR. WISNIEWSKI: I keep pushing this microphone closer and they keep taking it away from me. Do you want me to read that over again?

DR. HARGRAVES: Mr. Chairman, this is primarily because of a physical disability. Our good friend, Chester, with his hearing aid is only getting half of this, and for the sake of the Minnesota delegation, we want him to get it all.

MR. STEIN: Mr. Wilson, would you mind moving your chair over in this direction?

MR. WISNIEWSKI: I think I will read that paragraph again because I think it is pretty important.

MR. POSTON: Where is it?

MR. WISNIEWSKI: It is on Page 23, the first paragraph under "Conclusions."

> "Sewage and industrial wastes discharged to the Mississippi River from Minnesota cause pollution in the interstate waters of the Mississippi River which endangers the health and welfare of persons in Wisconsin and, therefore, is subject to abatement under the provisions of the Federal Water Pollution Control Act."

I stated that we in Wisconsin feel complimented because this same kind of a statement is not made about any sources in Wisconsin causing problems for the people in Minnesota.

However, I would refer you then to Page 34, and in the first paragraph it says:

> "In light of the excellent progress the MWPCC"

-- and I am assuming that means the Minnesota Water Pollution Control Commission --

> "has made in making various industrial firms and municipalities aware of the need for abatement facilities, the following time schedule for the foregoing remedial program is recommended. The time periods given commence with the issuance of the conference summary by the Secretary of the Interior."

Am I to understand from that that since Wisconsin has made such excellent progress, they have not found it necessary to mention it here at all, and at the same time they don't want us to comply with any of these schedules?

MR. PRINTZ: No, sir. The lack of a pat on the back here is a mistake.

(Laughter.)

We had every intention of pointing out the excellent progress that Wisconsin has made, and will continue to make. However, no matter how many times we review, re-read and re-edit, we are guilty of an omission.

We do feel Wisconsin has made a tremendous gain, has done a good job, and still has to comply with the recommendations of the conferees.

MR. WISNIEWSKI: Those are all the comments I have, Mr. Printz.

MR. WILSON: Mr. Chairman.

MR. STEIN: Yes.

MR. WILSON: In view of the fact that just now, because of my hearing defect, it was recognized that I probably could not hear all this conversation and I was invited down here to this end of the table so I could catch the point, I would like to make a couple of comments at this time on the relationship between the State of Wisconsin and the State of Minnesota in dealing with this water pollution control program.

To my good friend, Mr. Wisniewski, here -- he and I have been associated in these efforts for a good many years in different capacities -- I want to say that Minnesota has always recognized the outstanding leadership shown by the State of Wisconsin in this field. They were ahead of us in pioneering, in systematic efforts to deal with the water pollution control program, and set up the Wisconsin Water Pollution Control Committee in connection with the State Board of Health many, many years ago, and Mr. Wisniewski has long served as their director before the new Wisconsin organization under their 1965 law was formed.

All through the years there has been very close cooperation between the State of Wisconsin and the State of Minnesota. We more or less followed their smoke when we framed our Water Pollution Control Act of 1945, which set up our Commission. It was composed somewhat differently, but still in much the same manner, with representatives of the Board of Health and the Conservation Department and other interested agencies, and very closely integrated with the Board of Health.

We followed their example in setting our law and worked closely with the Commission in studying the problems on the Mississippi River, and I am very sure that if there is anyone who has drawn any erroneous conclusions from the fact that the framers of this report here did not mention the excellent progress that the Wisconsin authorities had made in dealing with their problems, it was simply because of the fact that it so happens that on the Mississippi River the worst pollution problems are in Minnesota, the ones that call for the greatest effort and attract the greatest attention.

It has been a comparatively simple matter for the Wisconsin authorities to require the towns on the Wisconsin side of the Mississippi River to provide sewage treatment facilities, whereas it has been a problem that ended with tremendous difficulties, as our Chairman here, Murray Stein, recognized at the opening session of this session, in which he complimented the authorities for the manner in which they have dealt with this pollution problem here in this State's metropolitan areas as compared with other areas of the country.

Now, certainly, that cooperation is going to continue, and I am sure that full credit will be given to the leadership and progress in Wisconsin, as well as the credit to which I think our own Minnesota Water Pollution Control Commission is entitled for the way they have tackled the metropolitan problem.

Wisconsin has, of course, had even greater industrial and metropolitan problems in the Milwaukee area and on the Wisconsin River, with all the paper mills. They have had tremendously difficult problems in this area, and have dealt with them aggressively. I think that we can count on the same kind of action in both States from now on.

MR. PRINTZ: Mr. Chairman, with your permission I will get together with the court reporter and correct this omission before the report is printed in the record as read.

MR. STEIN: I think Mr. Wilson's remarks are well taken.

By the way, some of you may not know this, and I am sure most of you don't, but years ago Mr. Wilson was a crackerjack, if not the crackerjack, court reporter. He does take notes in shorthand and he takes the best notes of anyone I have known in the business.

However, I do think his point is well taken about the job that the States have done in this area.

This is kind of a paradox in this field, where you get the Federal Government coming in with a report and a study like this, oddly enough in places where the States are doing a pretty good job, and the difficulty is, I think, we have the same problem all over the country. Where the States are dealing with their big, big cities, as you are here in Minneapolis and St. Paul, you have a very, very difficult situation.

Secondly, if the States were doing nothing and the cities and industries consequently were doing nothing, the report is a relatively simple matter. Mr. Wilson has worked with us on many occasions in the Missouri where there was absolutely no treatment at all. People were putting their wastes in raw, and there we could send a crew out and they could come up with the results in a month, or, at the most, two months.

Where a State or two States have had active programs, we have had a considerable amount of work. When they are in the process of trying to develop a district to handle this, they get buffeted about in the Legislature. Where everyone is providing, or almost everyone is providing some kind of treatment, you can't say they are all bad, and you all have to put this in. You have to go through the area with a scalpel and examine each plant to see if they are putting in adequate treatment, and what has to be done to improve it.

This is the complicated area that we have in pollution control. I think the fact that we spent so long in the study and we have this big panel, and this is such a complicated problem, is a reflection of the active programs of Minnesota and Wisconsin.

If these States did not have these active programs, we probably could conclude this conference in a half hour and say, "Everyone is putting waste in raw. Get secondary treatment," and go home. This would be very easy.

But, I do think the point that Mr. Wilson has made is well taken, and we have to recognize the difficulty of the problem. It is more difficult to deal with gradations of color than with black and white.

Mr. Holmer?

MR. HOLMER: Mr. Stein, yesterday afternoon I met with representatives of the Department in the Water Resources Council in Washington. Among them were presentatives of the

Department of Health, Education, and Welfare, in which organization there is the Public Health Service.

Coliform Guide C, which appears on Page 27, and I would like to have Mr. Printz comment on it, suggests an average concentration of not more than 4,000 per 100 ml.

I would like to have him comment on the distinction between this and the Public Health Service standards with respect to municipal water sources.

MR. PRINTZ: Yes. The municipal water supply suggested criteria by the Public Health Service is 5,000 per 100 ml. However, at the present time, the only water supplies being taken from the rivers were within the State of Minnesota, and where we did apply this "C" we did utilize the guide recommended by the State, and that is 4,000 per 100 ml, as opposed to the Public Health Service less stringent one of 5,000 per 100 ml.

MR. HOLMER: Will this have any effect on the water quality criteria which are being adopted by the several States in their correlation as we move along towards the activities for the rest of this year? Illinois, as I understand it, has adopted 5,000. Our rough draft is 5,000.

MR. PRINTZ: I don't believe so.

MR. STEIN: Wisconsin is 5,000 too?

MR. HOLMER: Yes.

MR. STEIN: We are dealing with water. Is there any advantage in not having uniformity with the rest of the country on this?

MR. WISNIEWSKI: Mr. Chairman, I would like to comment on that and ask Mr. Printz if this isn't related to the number of stages of treatment of the water -- for example, if this is associated with complete rapid sand filtration or its equivalent with continuous post-chlorination.

Now, if there were additional stages ahead of this or behind this, you could probably handle the water with a lower quality from the coliform standpoint.

MR. PRINTZ: I am not sure I fully understood what you said due to the muffling of the microphone, but this could be reworded in such a way so that it could bring out more about the treatment; yes.

MR. WISNIEWSKI: For example, if you wanted pre-chlorination, presettling, and filtration.

MR. STEIN: Let me try this:

As I understand this operation, Minnesota has 4,000, and I think Mr. Holmer is exactly right in pointing out that it is 5,000.

As you know, for years we were with the Public Health Service, and that was the figure of 5,000. Possibly it may not be in all the other 49 States other than Minnesota, but pretty close to those 49 deal with 5,000.

I think Wisconsin, if we are dealing with 5,000, is complying with the Public Health Service recommendations and the recommendations followed by the Public Health Service not only in a vast number of States, but practically all of the States, almost unanimously. I would estimate it is 48 or 47 at the least. I know of no other State other than Minnesota that has this 4,000.

The issue is because Wisconsin is a neighboring State.

By the way, I agree with Minnesota that it should be as low as possible, but with the one State in the Union, as far as I know, that is a little lower, is this the time to get Wisconsin down to that lower standard just because they happen to have that wonderful neighbor next-door?

(Laughter.)

So, if it is 5,000 and Minnesota wants to maintain 4,000 and exceed the requirements, what is the difference?

MR. WISNIEWSKI: I still don't think my point was caught.

The point I am making is that the coliform concentration in the raw water is normally used in determining the number of stages of water treatment that will be necessary to produce a satisfactory potable water, and we may have a situation here where this 4,000 is being geared to an existing water treatment plant which does not have all the stages that are needed, for example, to properly handle a 5,000 per 100 ml water, but can handle the 4,000 per 100 ml water, so that it isn't a question of the coliform standard alone in relation to drinking water supplies. It is the coliform standard, plus the number of stages of treatment that are provided.

MR. PRINTZ: Correct.

MR. WILSON: Mr. Chairman, on that point, may I ask Mr. Wisniewski a question?

Are there any municipal water supplies being drawn from the Mississippi River or the St. Croix River, for that matter, anywhere below the Twin Cities, drawn past the south Wisconsin line?

MR. WISNIEWSKI: I don't know of any. Do you, Mr. Muegge?

MR. MUEGGE: No, there are none.

MR. WILSON: There are none. I think the nearest one below the Twin Cities is Davenport and Rock Island.

MR. MUEGGE: It should be recognized, however, that we are establishing a criteria which may become a standard, and this will probably exist for some time. There is no reason, therefore, why the 5,000 limit that has been used throughout the country for water supplies with sedimentation gravity filters and post-chlorination, should not prevail.

I would say that if Minnesota wished to be more stringent, it could still do so in their operations within Minnesota. We have plants and have raw water quality that has a coliform content of much higher than 5,000, and they are not producing a water that conforms with that established by the United States Public Health Service for a safe drinking water supply. Actually, I think your whole solution would be to continue to add to your water plants and produce water from a poor source that will be wholesome and healthful for the people.

MR. WILSON: Mr. Chairman, might I just add that when I called attention to the fact that there are no present municipal water supplies being taken from the Mississippi in this stretch of the river, I am in no way implying that the standards should be lower beyond the needs of existing uses or even of the possibilities that with the increasing population it may be necessary for some of these communities to take water from the Mississippi River. Therefore, I for one am in favor of holding the standards to the highest practicable level and letting you call attention to the fact that the Minnesota Water Pollution Control Commission has imposed the very highest reasonable standards in adopting the standards which it did on the Mississippi River, especially above the St. Anthony Falls Dam, where the supply is taken from the Mississippi pool.

They are now in litigation and in a battle which is going to the Supreme Court because that standard was attacked as being too high.

MR. STEIN: Do you have anything, Mr. Poston?

MR. POSTON: Mr. Chairman, it appears to me that inasmuch as other States along the Mississippi River have a standard of 5,000 coliform per 100 ml in such situations, that if we want to get on with the rest of the program we should insert "5,000" instead of the "4,000" in the report here, and that Minnesota can then hold to their more restrictive requirements within the State of Minnesota.

This is probably the only way we can agree to a standard for this particular place today.

MR. STEIN: I don't think there is really any disagreement here. We are all aware of Minnesota's 4,000. I don't think they are going to object to 5,000 in the contiguous waters.

MR. SMITH: If Minnesota is 4,000, why go up to 5,000?

MR. STEIN: Well, here is the situation: Looking beyond this, obviously, we are going to have to set a standard for interstate waters.

MR. SMITH: This is not what we are doing intrastate.

MR. STEIN: Wait a minute. So we are coming up with a requirement here today.

I don't know that you can expect the Federal Government to require one standard for the water intake of Wisconsin and another standard for the water intake of Minnesota in areas that are absolutely contiguous to each other, or even anywhere else. We have these coliform standards for raw water intake recommended anywhere throughout the country.

Now, this does not prevent anyone from adopting a more rigid standard, or more rigid requirement.

The Public Health Service is the guardian of the health of the people here, and, endorsed by the State and Territorial Health Office, have come out with this figure of 5,000 that they have endorsed throughout the country. When, to the best of my knowledge and belief -- and if I am wrong, I would like to be corrected -- the United States has adopted that 5,000 figure, on what basis do you suggest that we in the Federal Government go to Wisconsin and tell them that they have to come down to 4,000, just because their wonderful neighbor across the river has that now?

Suppose we were dealing with Illinois and Indiana.

There would be no question that we would endorse 5,000 for both. Or New York or New Jersey.

What basis do we have for asking Wisconsin to come down to 4,000, when the Public Health Service has recommended 5,000, when 48 States, as far as I know, have the 5,000 figure, and we have plant after plant with a raw water intake of 5,000 turning out a safe and potable water supply with no incidents of disease?

Go ahead, Mr. Muegge.

MR. MUEGGE: Mr. Chairman, as long as this has been discussed here, I would suggest we leave it up to the executive session to make a determination.

MR. STEIN: Right.

Are there any further questions, Mr. Wisniewski?

MR. WISNIEWSKI: I would just like to suggest that one possible solution to this might be taking the table on Page 26 and striking the "C" out of the section on the St. Croix River, and just use the "A" there.

I can't understand why the "C" was included. Is there any water intake on the St. Croix now?

MR. PRINTZ: No, there is not.

MR. WISNIEWSKI: If we just strike the "C" there, it would not apply to any Wisconsin waters, because the other section applies to the Mississippi River above Anthony Falls.

MR. STEIN: All right.

Mr. Printz, I have two fast questions. Why did you come down to three parts per million for oxygen in some of the places?

MR. PRINTZ: We came to three parts per million oxygen in two of the places, one the reach of the river on the Mississippi below the Minneapolis-St. Paul Sanitary District, and also on the lower 30-mile reach of the Minnesota, the reason being that the levels we called for, the three milligrams per liter, are the minimum dissolved oxygen levels which will occur only at that minimal flow of seven consecutive days once in ten years. As it turns out --

MR. STEIN: Just a minute. Don't go too fast.

The question here is this: Assuming the present loadings, supposing the place grows and you get bigger loadings, what do you do? If we are going to hit three at the low ebb once for seven consecutive days every ten years, that is all right; but if you put the figure 3 in, that will permit new portions to come in and lower the requirement to 3.

At the risk of oversimplification here, 3 parts per million of oxygen is not a very desirable level for fish life for reasonably good sport fish. Striking towards the lower levels, 4 or 5 is much better.

MR. PRINTZ: I will give you a bit of background as to why this was done.

As we indicated in the report as I presented it, if all the conditions were met we would have available certain water uses in those reaches of the river. As it turns out, by our calculation, if all those conditions are met, there will be on the Mississippi River in that reach for about 75 percent of the time a dissolved oxygen of 5 milligrams, or higher.

MR. STEIN: That is assuming again, Mr. Printz, the present loadings. I hope the area is going to grow.

If we give someone a requirement, if we are going to have 5 parts per million 75 percent of the time, let's say it; but if we give anyone a loading of 3, we can permit new industry and new cities to come in with relatively small treatment and go down to that level for 100 percent of the time, not 75 or 25 percent.

MR. PRINTZ: Sir, we specified loadings with this purpose in mind: Our engineering studies, as well as the mathematical model developed for the river, have given us the allowable loading which can be put into the critical reaches to insure maintenance of this oxygen level. We have not attempted to apportion this maximum loading out, and we are recognizing that this is --

MR. STEIN: I am aware of that.

MR. PRINTZ: Yes.

MR. STEIN: But let's try to translate what you have done here, sir.

I recognize what you have done in the engineering way. You based your control on the loadings when you put 3 parts per million in the stream.

MR. PRINTZ: Yes.

MR. STEIN: What is going to happen five years from now when someone has this 3 parts per million of oxygen, which isn't very good, and they say, "We can increase the loadings 75 percent of the time immediately and we won't do violence to your stream"?

I think that when we get down to this, the key control to the stream is that you have the water quality in the stream, and then we work back to the effluent requirements and the effluent standards and the loading requirements.

Once we have lowered the requirement in that stream to 3, and you are depending on your effluent requirement or your loadings at the present time to keep that up, it seems to me you have left the door open for someone to chip away at that and chip away at that. And who can surely maintain that 3? You don't mean 3 here; you mean 5 here at least 75 percent of the time; you mean 4 some part of the time; and 3 for seven consecutive days once every ten years. I think we have given everyone an open-door invitation to get down.

By the way, I raised this point with the States, because I think we should have the same viewpoint and philosophic approach here. Any number you want is all right with me, but I think setting the lowest depth that we hit once in ten years as a requirement is an invitation to go down to that, instead of keep it up.

I suggest you keep in touch with that.

I have one further question. Turn to Page 29.

When you talk in terms of a 20 percent of the mass of 5-day BOD, that could mean an 80 percent reduction in BOD, more or less. Is that correct?

MR. PRINTZ: That is part of the general recommendations.

MR. STEIN: Now, you talk in terms that are to meet an immediate problem, and I think that is right.

Now, as I look at your 80 percent, if obviously you get 80 percent, you don't have to use secondary treatment.

Then we come to the question: What do we mean by secondary treatment?

We give you the question again. You have two choices here, and I am leaving out the intermediate ones of adding chemicals for purposes of simplification, unless you want to bring it in, but we go in there with a trickling filter, or an activated sludge plant. With an activated sludge plant properly operated, you should get 90 and above, and not 80. If you are going to run a trickling filter and you are operating under optimum conditions, you are going to get an 80 percent reduction.

However, the likelihood of your running under optimum conditions all the time and hitting that 80 percent, as I think we all know, is remote.

So here we are faced with this dilemma, and I ask you to do this: If we are talking about an 80 percent reduction, are we fooling ourselves and kidding the public by thinking that putting in an activated sludge, or, rather, a trickling filter, we are going to get 80 percent all the time? If we are going to run in the 70's or 75 and this is what we want, let's say so, but if you are talking in terms of 90 percent treatment, let's get up to the 90 percent.

Now, as far as I can see, we are left with this: A trickling filter plant which will operate at optimum efficiency, which is almost impossible to achieve to get this, or an indifferently run activated sludge treatment plant.

Why the 80 percent recommendation?

MR. PRINTZ: Well, the 80 percent was recommended to take care of all of these smaller sources of waste to the same area, and, of course, in addition, to take the place of a specific recommendation in which loadings are specified.

MR. STEIN: In other words, you say the treatment plants in Minneapolis-St. Paul probably would have to have a higher degree of removal than this?

MR. PRINTZ: Yes.

MR. STEIN: All right.

In other words, they will probably have to have a well run activated sludge plant, or its equivalent. Is that right?

MR. PRINTZ: Yes.

MR. STEIN: Fine. In other words, you have put this general recommendation in for the smaller plants?

MR. PRINTZ: Yes.

MR. STEIN: This is what I am getting at. What do you specify, a trickling filter?

MR. PRINTZ: There will be both.

MR. STEIN: All right.

Are we looking for violations when we talk in these terms? In other words, are we going to be faced with the situation where, when we talk about this 80 percent removal around the smaller plants in Wisconsin and Minnesota around here, we find the bulk of these plants not being 80, but in a range between 70 and 80?

Again, I am talking for the State agencies, as well as us. This is the most vexing kind of regulatory problem you get, where the fellows are not really blatantly polluting, but they are all below a specific requirement.

I am raising this question with you, because if we are going to look at this stringently and we mean the 80 percent, are we going to pass up the 70 and 75 percent, and how many plants do you get like that?

Maybe we will leave that until later too.

MR. WISNIEWSKI: I am just trying to do some figuring here.

MR. STEIN: All right.

MR. WISNIEWSKI: Actually, there is an inconsistency here, where you say that municipal wastes should be treated so that you have just 20 percent of the mass remaining and then accept a permissible loading at 68,500 pounds for the stretch governing the Metropolitan Sewage District, plus South St. Paul. The Metropolitan Sewage District alone has 268,000 pounds of BOD coming in. This 68,000 represents 26 percent, so that actually by using the limiting loading, you are only asking for 74 percent removal; whereas in the other section on the top of Page 29 you are asking for 80 percent removal.

MR. PRINTZ: The specific recommendation on the Mississippi River referred to a maximum BOD of 68,500 pounds per day of 5-day 20°C BOD from that reach of river which would include both the Minneapolis-St. Paul Sanitary District and South St. Paul.

The district right now has secondary treatment under construction, and hopefully will be up to design capacity -- that is, design at the time -- by around August of this year. That 75 percent I believe will still only take it down to about 98,500 pounds per day. We are calling for a total from them as well as South St. Paul of below 68,500, which would mean, depending upon how the State would apportion out the allowable loading, there could be a much higher degree of removal required of the Sanitary District than the 80 percent specified under the general recommendations.

MR. WISNIEWSKI: The actual figures show that 68,500 represents 74 percent of the 268,000 that is now being discharged, or was being discharged out of the Metropolitan Sewage District plant. Divide 268,000 into 68,500 times 100, and you will find that that is one-sixth, or 26 percent remaining.

MR. STEIN: Let me go to this again.

I can see the recommendations you have made for St. Paul and Minneapolis and maybe some of the industries for reducing their wastes.

In order to meet this general requirement, why don't you pick one of these small towns here? What would you recommend? Say we have this requirement. Do you know any small town here that needs a waste treatment facility that you have recommended in the area? What would you recommend?

MR. PRINTZ: Are you throwing that question to me?

MR. STEIN: Yes, to you.

MR. PRINTZ: I myself would probably recommend an activated sludge plant. However, there are trickling filter plants within the study area that are giving consistently higher than 80 percent removal.

We have built in a checks and balance system here by requiring minimum laboratory conditions and records as well to be submitted to the State for evaluation. This is not being done at the present time, but we think it will go a long way towards insuring proper operation of these treatment plants.

MR. STEIN: Do you think with trickling filters you can get over 80 percent?

MR. PRINTZ: With proper operation, yes.

MR. STEIN: All right. Again, this is the point I want to make.

I agree with you that you would recommend it would be safe to put in the activated sludge plant. The notion that they can get 80 percent removal with a trickling filter plant is, I would say, problematical at best, but it requires a kind of management of treatment plants that at least I have not experienced in the United States.

Maybe you are different here, but I don't know why you should be, because you have town councils, and they have just so much money. The tendency, when you get a trickling filter plant, is that it is put there on automatic pilot and they let the thing run by itself.

I think here maybe we could do this with a hard look at reality. What I am asking is that we don't come back in five years, when we have all these plants built, and find 90 percent of the small towns with technical violations -- with everyone that doesn't put in an activated sludge plant in violation of this operation, having somewhere between 60 and 80 percent removal.

This may or may not be a critical situation or a pollution situation, but if we are going to put this in, I think we should give the States something which they can check off fairly rapidly and enforce.

MR. PRINTZ: One comment I would like to make to Mr. Wisniewski: I believe the 268,000 to which he was referring perhaps came out of Table 3, relating to the Minneapolis-St. Paul Sanitary District.

I might point out that these are constituents discharged after there is approximately 30 percent treatment and may not be the influent to which you were referring when dividing it by 68,500.

MR. WISNIEWSKI: The influent would be considerably higher, and they would have to go well over 90 percent.

MR. PRINTZ: Again I say we did not attempt to apportion the loading out or speak in terms of percent removal for the larger waste sources.

We felt our job was to determine what the maximum allowable loadings to that stream could be from any sources within a specific reach in order to maintain the minimum conditions as specified. We would leave this up to the State to apportion, and we would hope that the State, in apportioning out the allowable loadings, would take cognizance of future growth and would perhaps set aside a certain amount of that allowable loading for such future growth.

MR. STEIN: Are there any further questions or comments?

MR. MUEGGE: I would like to ask Mr. Printz a few questions.

Mr. Printz, another proposition: On Page 20, under the St. Croix River, in the last paragraph, in your second sentence, you indicate:

> "Better control of natural and agricultural sources is required if nutrient concentrations

are to be lowered sufficiently to reduce algal densities in late summer."

Have you anything in mind as to the method by which you are going to accomplish this?

MR. PRINTZ: Well, basically, we might say that at this time about all we can do is endeavor to work with the agencies that are responsible in this area, such as the Soil Conservation Districts, to indoctrinate them into the problems of nutrients and help them to develop and put forth the conservation programs which would lead to a reduction of nutrients into the stream.

Here again we point this out as a need, but do not call for any specific recommendations.

MR. MUEGGE: Then in the next sentence it refers to greater control of discharges from boats.

As you perhaps know, Wisconsin is exempt now on the St. Croix River, but I just call attention to that.

MR. PRINTZ: This boat thing, of course, as it says, includes "as well as the bacteriological quality," so here again we are speaking of debris, and other unsightly things, such as beer cans.

MR. MUEGGE: Wouldn't it be well to have a recommendation in the record that holding tanks be provided?

MR. PRINTZ: Because of this difference between the two States, the recommendation was prepared as it is, in terms of adequate treatment.

I am afraid we would have to leave this up to the States to define what "adequate treatment" would be.

MR. ODEGARD: Mr. Chairman, speaking from a position in between the two States, the Minnesota-Wisconsin Boundary Area Commission is requesting that both States adopt the Wisconsin standard of holding tanks, and we do have legislation in that connection, as well as the Federal Government, to see fit to support this sort of a standard.

MR. STEIN: You mean on boats?

MR. ODEGARD: On boats.

MR. STEIN: Just holding tanks?

MR. ODEGARD: Yes.

MR. STEIN: How about the new toilets that are being developed?

You mean to hold until you come on the land?

MR. ODEGARD: To hold it.

MR. STEIN: How about the treatment devices on the boats?

MR. ODEGARD: The conclusion of the Commission, having studied this, is that they are inadequate in local situations, as far as local problems in our own rivers.

MR. STEIN: I guess we should leave this on the record. The question here is: What do you do with wastes on the boat, whether you hold them, put them in tanks and hold them and then dispose of them when you get to shore, or do you have an adequate waste disposal method on board ship?

Now, of late, because of the great interest in the problem, there have been some devices coming forward which cost in the price range of the average small boat owner, which may prove highly valuable and work, and the Federal Government is in the process now of evaluating these devices.

You may have come to your conclusions that holding tanks are the way out, and the only way out. I don't think our Department or the Federal Government has come to that conclusion yet.

We are in the very active process now of having several projects going on testing these devices, so, in answering your specific question, I doubt very much whether the Federal Government at the present time would plug for just a holding tank ordinance. You may have a device on the boat, or a holding tank, depending on which works, but I don't think the scientific judgment is that the holding tank is the only reasonable device to use on a small boat.

MR. ODEGARD: The recommendation that the Commission arrived at was not a scientific or a chemical basis, but on the basis of the local situation, where boats are lined up along shore and kids are swimming all about them.

Even chlorinating the sewage is not really appropriate in a situation like that, and, therefore, the Commission is making a recommendation for legislation in both States to get together on this particular point.

MR. STEIN: You very well may have a point there. I don't doubt that in the least, that you may be in local situations in your State where, because of the nature of the water system, particularly in lakes, you don't grind up sewage into the lake, even though it would be chlorinated, because of the nutrients that would be coming into it. This may be entirely appropriate.

Your question was, will the Federal Government support you on this. My feeling now is, and I have worked with State legislation, that I am not sure our scientific staff has given us clear enough signals where we could go ahead with that and put that out as legislation necessarily that we would support.

I would suggest that in the situation you have, particularly in your boundary area with all those small lakes, that there be a judgment that you want no wastes put in the lakes, treated or untreated, because you want to protect those lakes from overfertilization, and eutrophication might be a fine administrative point, and you could go ahead.

I would be glad to come up and talk to other people on the local situation. I don't think you are going to get the Federal Government to come out with a statute proposing that within the real close future. We have a lot of work to do yet.

MR. ODEGARD: I was thinking of the support in terms of Federal boats.

Would they conform to the State laws?

MR. STEIN: Oh, yes, I would hope we would.

Again, let me say this: We deal with independent Federal agencies. I would think if we came to a judgment with your State groups that the way to manage pollution control on X body of water in an inland locked body of water, that the thing to do in that body of water was to provide holding tanks, we would be prepared to go ahead and work with you and recommend that for all the Federal boats in the area, surely.

MR. WILSON: Mr. Chairman, may I just make a comment on that problem?

I want to concur very strongly in the comments made by the Chairman. The Minnesota-Wisconsin Interstate Commission has very gravely oversimplified the problem. This is not simply a case of an agreement between the States of Minnesota and Wisconsin, because the Mississippi River simply teems with boats that come all the way up from the Gulf of Mexico and from the Ohio River and the Missouri River. Unless two things are done, first, to provide adequate disposal facilities all along the banks where boats may pump out the contents of their holding tanks, and, second, to have the same regulations in force all the way up and down the Mississippi River and the Ohio River and the Missouri River, and even around on the Gulf of Mexico, so that the boats of travelers coming up the river will all be equipped with the type of holding tanks, it is simply foolish for Minnesota and Wisconsin, even assuming they could agree on it, to adopt any such restriction.

This is really a Federal problem, to secure the adoption all the way up and down these interstate navigable waters of a uniform requirement which all the boats can comply with.

MR. STEIN: Mr. Muegge?

MR. MUEGGE: I have one other question -- in fact, I have two, one that I would like to have a comment on, and that is regarding the paragraph in the left-hand column on Page 29 at the bottom of the page entitled "Phosphate Removal."

> "New waste treatment facilities be designed to provide adequate capacity of individual units and components as well as maximum flexibility in order to permit later modification in operating procedures so as to effect the greatest amount of

phosphate removal."

Does the Federal Water Pollution Control Administration have in mind what may be required in the future in the way of phosphate removal that should be incorporated in existing plants?

MR. PRINTZ: Do we have in mind what will be required in the way of phosphate removal so that they can be incorporated into existing plants?

MR. MUEGGE: Yes.

MR. PRINTZ: As I have indicated, we feel we do have information of this type. Mr. Wisniewski does not feel that we have it of this type, because our work that has been carried out has been done so in the South.

However, as I have indicated, the Federal Government is sponsoring three demonstration projects around the country for phosphate removal, one of which will be in the Midwest in the City of Detroit. This is already under construction at this time, and we will soon, I hope, have results which we can make available to the engineers from Wisconsin, and to the other northern States.

MR. MUEGGE: Very good.

MR. STEIN: All right.

MR. MUEGGE: I have one question left, which is a matter of information.

Your records show a considerable fecal count, coliform count, in some of the industrial wastes. I would like to pick out a few here like --

MR. PRINTZ: Which table are you on?

MR. HOLMER: Table 4.

MR. MUEGGE: There is one on Table 4 above the Pittsburgh Plate Glass. Why do they have a high fecal coliform count?

MR. PRINTZ: This is the Pittsburgh Plate Glass Company?

MR. MUEGGE: No, the one above that. That is the Foot Tanning Company. I'm sorry. I will find one in a minute. I gave you the wrong one.

How about the American Crystal Sugar Company? Why do they have a high fecal coliform, a high fecal strep?

MR. PRINTZ: I believe this you will find would be inherent within the type of processes that they utilize, this being working with sugar beets. I think we have found the same thing over in the Red River of the North.

MR. STEIN: Off the record.

(Discussion off the record.)

MR. MUEGGE: As I remember the report on this particular industry, the sewage is discharged to the community sewage system.

MR. STEIN: This may be. We don't know that all

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the sewage is discharged to it. This is a question of an in-plant operation.

We have had these questions come up before. We have always found fecal strep in some quantities, and we found them recently in pulp mills.

When someone has raised a question like Mr. Muegge just raised, when we investigated these cases, we always found extraordinarily high counts in the past, and a contamination source of someone's pumping these organisms into what we felt was a culture medium. They were proliferating very rapidly.

Generally, when this happens and you get these high counts and you find the source, everyone is delighted to stop it right away.

MR. MUEGGE: I would just like to ask Mr. Printz if they made any special study to find out what caused that?

MR. PRINTZ: In reply to that, and reviewing the Page IV-38 in your text concerning the waste source from the American Crystal Sugar Company, to the best of my recollection there were no special in-plant studies carried out.

I do believe, however, that at the present time this would be an academic question, because the American Crystal Sugar Company has recently installed a closed system, which I believe we will hear about later and which will update our report.

The reason I would not be in a position to elaborate on it is that I believe it is an academic question.

MR. MUEGGE: All right.

MR. STEIN: Off the record.

(Discussion off the record.)

MR. STEIN: I think at this point we will take a ten-minute recess.

I think the portion after we recess is going to be a very vital one. We are going to hear from Dr. Hargraves of Minnesota.

Minnesota has, as I understand it, some very special views and special problems with relation to this. For those people from Minnesota who are in the audience, this may well be the most productive part of the session to listen to. You have heard the Federal Report and Wisconsin, and I think it is only fair that we make every effort to give Dr. Hargraves the full audience and hear what he has to say about that.

With that, we will recess for ten minutes.

(Whereupon a recess was had.)

MR. STEIN: May we reconvene?

Dr. Hargraves, will you proceed?

STATEMENT OF DR. M. M. HARGRAVES,
CONFEREE AND CHAIRMAN OF THE MINNESOTA
WATER POLLUTION CONTROL COMMISSION

DR. HARGRAVES: Mr. Chairman, Fellow Conferees, Ladies and Gentlemen:

Part of this will be prepared. We are going to divide this into two sections. I am primarily going to introduce the subject and give a little talk, and Lyle Smith, who knows, of course, so much more than I about the technical aspects of this, this being in water pollution, will have a statement, I believe, that you can use.

The Minnesota Water Pollution Control Commission does welcome, for many reasons, the reconvening of this conference.

I had prepared a statement. In fact, as you may well have guessed, as newspaper items came out over the last four or five days, I became more and more agitated, until I am afraid my wife thought she was going to have to put me away for a little while until I calmed down.

(Laughter.)

Consequently, each day I wrote statements, and they became more and more or less and less violent -- I will put it that way -- and the things that I do have to say are in part just going to be said off the top of my head, because I have had fourteen years now on the Water Pollution Control Commission and one needs about that long at least, being a physician of my type, perhaps to absorb all of the things that happen and that are of importance in water pollution control.

To me this has been a challenge, not just from the standpoint of technicalities, but this is a socio-ecological-economic problem, and it has far greater ramifications from my standpoint than the number of colon bacilli that are found in somebody's outlet in a certain stretch of the river, or I would have been off the Commission long ago.

I feel that people who get interested in these things, just as many of you who are on many commissions and many committees, do it out of a public service spirit.

I am on the Water Pollution Control Commission, as you very well know, as a volunteer without salary, and on my own time as a physician. So is Mr. Tuveson, an attorney, and so is Mr. Scott, who represented industry. The other four members of our Commission are ex officio men from the government, and their work piles up on their desks, but their salary goes on, as does it, I presume, if they have to get out of town.

We are at a cross-roads in Minnesota and we have seen it coming. People might well have said, "You should have seen it a long time before." Many things have happened in the last six years.

When Chester Wilson was my tutor as Chairman of the Water Pollution Control Commission back in the 1950's, we met rather lackadaisically, I would say, at ten o'clock in the morning, and we were usually through at about three, and we often held quarterly meetings, or meetings every two months. It is a little irritating to have it thrown up to you by certain individuals in power that we are not efficient because we are not full-time, because we meet quarterly.

Since I have been Chairman of the Commission, we have one to two days a month at 8:30 in the morning, and we have worked until exhaustion, around 5 or 6 o'clock at night. This goes on week after week.

This problem has multiplied, and it has multiplied in large part because of difficulties of getting some of these jobs done. If it is not tremendous, it is horrendous.

I think you deserve to know where some of these things arise and the fact that unhappily Minnesota may not be able to qualify by June 1967 and we will be having this enforcement taken on by the Federal Government.

Now, this is a sad situation, but it has arisen from a series of circumstances.

As I say, I am a physician. I take care of patients. I can hardly stop from thinking in the terms of a physician, because the river system which we have I consider, and have for a long time, a very sick patient.

There is a time when we are called in consultation, and in the practice of medicine, since I am primarily a consultant in certain diseases, leukemias, lymphomas, blood diseases and others, I often have patients referred to me, and sometimes, because patients prefer to come back to you because this happens to be your specialty, even though you return them to their home doctor with recommendations and the like, sometimes they come back to me, and this is not an ethical thing to happen because I have supposedly stolen patients.

We called the Federal Government in -- the family did, at least; the Commission didn't (Laughter) -- the family called in consultation, and, if you will remember, three years ago we had a long two-day session. With all due respect to Mr. Stein and his tremendous schedule and his need to catch the plane thirty minutes after I read my last statement, this actually was the end of our conference so far as this sick patient was concerned. Then, two and a half years later, a week ago, or two weeks ago last Saturday, in fact, this big, square box of six volumes arrived on my front porch as a preliminary consultation for me to digest to help take care of the patient.

In the meantime, other things have happened, such as there was an article in the paper, because it has been hinted that we will not be able to meet the June 1967 deadline, which we felt sure that we could. When we first got word of this when this bill was signed a year and a half ago, we took our staff and divided it up into teams of four, four men in four groups. We started holding hearings, and these four task forces were to go out and carry out what is necessary in our law, which I will get to in a few moments.

Now, two years ago, McCallum in the Public Health Service had a study made, which I think has always been an important study, and I am happy to note that the Federal Government has included it -- you may find it on Page 21, if you wish -- but in this study they took representative States, and from the amount of work and the amount of water and various other things that technicians used to arrive at a figure, they felt that Minnesota could get along with its water and its water problems at that time with a staff of 58 people, but its desirable staff was 104 people.

At the present time, we have been allotted 40, and at the present time we have 27. The four task forces have been completely lost. Other States have been able to pay more money, and I'm sorry, Mr. Stein, that the Federal Government didn't get more of them, because I would have had something on you, but you did take our biologist away from us (Laughter), and this is all. The engineers have gone elsewhere.

You cannot run a sewage disposal plant and a sanitary district and a water pollution control commission without competent engineers, and with a salary schedule such as we have, and by some of my judicious writings to different States I find the average salaries are lower than the median, even including many of the southern States, which is no reflection on the southern States -- they are considered not to be as high in quality with water pollution control because of many physical as well as thermal factors as the north is.

This means then that this problem has arisen, that this report has been given, that this seemingly participation of the Federal Government has not lived up to my expectations. It has not lived up to some of the expectations of our staff.

We expected from some of the wording of the law, as well as out of the context of the proceedings of the first one, that we would have such cooperation, but so far as this part or this stretch of the waters of Minnesota is concerned,

M. M. Hargraves

this is the first time Mr. Stein and I have met, or the first time some of the others have seen each other again, to get together periodically to discuss the things and see how the whole thing was going philosophically, ecologically, sociologically, as well as the technical figures.

Now, if this country of nearly 200 million people doesn't believe those facts of life in dealing with its sewage disposal problems, we are going to be in a sad way.

The contrary might be said of what was done on the Rainy River, and without Federal help except that it was international. With frequent conferences with the International Commission with Canada and the United States, Minnesota and Ontario, this entire problem was studied, conferences were held, there was agreement, and we have given the paper companies and the cities up there an adequate opportunity, we have held hearings, and when we were agreed, without need of the Federal Government, even though it is an international water, we have already issued the orders for the paper companies in Baudette and in International Falls.

There are economic repercussions to this thing since, unless my memory serves me wrong, this may cost the paper company $10 million at one crack. These things don't come cheaply.

Something ought to be said to the people downstream who have been complaining about the upstream, because again these various social aspects were taken into account.

In the ward, every patient you see has a past history, as well as a present history, and this patient has had a bad past history of two wars, the Second World War and the Korean War, the lack of engineers, the lack of personnel, the lack of material, and obviously the first plant on the Mississippi system that we were proud of certainly went into disrepute. I am sure that Mr. Mick and Mr. Robins and those out there have done their best in order to upgrade this plant as best as they could.

But do you overnight just build another plant because at the moment you have so much sewage?

A five-year study was given, and they spent the money for it, a five-year study to see what they would need. At that time we didn't have the so-called "pill." (Laughter) It was a very unfortunate thing. We didn't have some of the agricultural advantages we have now, and people began to flock to the big city until, as you well know, we have a complex of over around 80 or 90 communities, many of which aren't even near a stream, and this has become a problem that has given rise actually to the study.

When the five-year study was up, we ordered, if

I may say so to Mr. Mick -- I think we did -- he was ready, anyway. They went ahead and they spent $23 million, I understand, in updating a plant and moving a railroad and filling in and building more islands, and various other things, and have had a plant which can, and I hope without difficulties will be upgraded perhaps 90 or 92 percent before too long.

Was this a waste of time? Did the river suffer so badly following this study which may project us into the next thirty or forty years to handle the problem? They spent another $500,000, so that we can still go on and plan sewage and sewage disposal facilities to take care of an even larger population if the pill is as effective as we hope (Laughter).

Well, now, this is the patient and this is the problem. South St. Paul is in the same fix, and they have been doing upgrading in-plant work. They have a bad situation, we know. We have ridden them. We will see that they get on the ball eventually and get this taken care of.

We aren't loath to accept the help of the Federal Government on this, and I want to say that the work that they have done has been of tremendous help. But I think you ought to know that this less than 300 miles of river, which was studied by a staff which I think reached a maximum of 32, with our staff doing everything at its low ebb of 27 at the present time for carrying out the State work -- this maximum staff of 32 people took three years to do this study and cost three quarters of a million dollars.

As a State organization, I think you can see that if we duplicate this sort of thing, it is a problem, and a problem that has to be met.

One of the difficulties was pointed out today as far as legislation is concerned. Very often -- well, I shouldn't say that and I won't say it. Legislation is passed by lawyers and, for some reason for the most part, with due regard to my friend, Mr. Tuveson, on the Commission, lawyers often don't think biologically or ecologically, or appreciate some of the problems that are necessary to be met in planning working out population livability. Doctors don't often do it either, unhappily, but this enters largely into the problem.

When we take on a project now -- and I want you to get this -- when we take on a project to do anything about streams in classification, in setting standards, we have to meet the criteria that was set up by the legislature.

Now, in the so-called Rosenmeier Bill, they accepted the New York type of criteria, in which they set up certain classes of water, very much as you have seen, I am sure, in the criteria that we have set up. New York was the first to work this out, to my knowledge, and it took them well over fifteen years to classify the waters of New York.

New York does not have the amount of water we have, although they are a large State, and, as I say, for the cost and the work and the amount of this done for this less than 300 miles of stream, we still have 4,000 miles of interstate streams that have to be classified where we have to set standards.

Fortunately, as I say, the Red River of the North has been finished, and the Rainy River has been finished, but it leaves us with an appalling number yet of areas to be done, including small streams such as the Cedar River that goes through Austin, the Blue River that goes down through Iowa, and so on. These are all interstate waters.

Now, before we set standards, we have these many criteria to meet and we have to take into account a tremendous number of things, and if you want to read the law, on Page 24 you will see what faces us in the next five weeks -- not Page 24 of this, but of the Water Pollution Control Statute.

But let me just say that it is recognized that due to variable factors no single standard of quality and purity of the waters is applicable to all waters of the State or to different segments of the same waters.

This, I think, you often forget, because the Mississippi isn't one body of water.

The second one has to do with conducting public hearings after due notice.

"In adopting the classification of waters and the standards of purity and quality above mentioned, the Commission shall give consideration to the size, depth, surface area involved, volume, direction, rate of flow, stream grade, temperature of water.

"(b) The character of the district bordering said waters and its peculiar suitability for the particular uses, and with a view to conserving the value of the same and encouraging the most appropriate use of land bounding on these waters for residential, agricultural, industrial or recreational purposes.

"(c) The uses which may have been made or are being made or may be made of said water for transportation, domestic and industrial consumption, bathing, fishing, fish culture, fire protection, etc., have to be taken into consideration in classifying all such waters.

"(d) The extent of present defilement or fouling of said waters which has already occurred or resulted from past discharges therein, the need for standards for effluent from disposal systems entering the waters of the State."

M. M. Hargraves

Then, Subdivision 4:

"The Commission, after proper study and after conducting public hearings"

-- well, need I go on?

This has been done in about 280 miles of the Minnesota and the Mississippi Rivers. It has taken a staff of 32 people or less, and three-quarters of a million dollars, to make these determinations which we are talking about in these standards, and this is our job before we can classify any small lake, river, creek, or other body of water in the State of Minnesota.

Well, we have a dedicated group of engineers and they work night and day. The number of nights they go out and talk to councils, to talk to mayors, to talk to the League of Women Voters or Izaak Walton Leaguers, or others, where they may answer questions, is phenomenal, and, of course, is not necessarily reimbursed.

Now, to go back to the report. The legislature is in session. I am giving you this background because here stems the law -- whether we can work, or how we can circumvent or get it changed in order to classify our waters by June and be able to set standards. You can see that Minnesota is in a position to have passed upon it enforcement proceedings and that these things have to be done in the next 18 months, unless we make use of the last clause that is in the enforcement law.

Now, the report is helpful. As I said, it provides all of this detailed evaluation of river conditions, of pollution sources, areas of unsatisfactory water quality. Some of the information presented was previously lacking. We did not know about it.

With respect to the specific information on such things, for example, as ammonia and phenols, and various other things, Mr. Smith will talk about them.

On the side of failure with this, as I say, to me there has been a sense of a lack of rapport.

Now, I hope you take this kindly, all of you in the Federal Government. I know you are busy. I am a consultant too, and my telephone rings from all over the country every day, while I am in the midst of doing an examination of a patient, or taking the history, or some other delicate situation, particularly in a family scrap trying to settle things. I get a call from somebody in Los Angeles or elsewhere and spend twenty minutes with him over the telephone giving consultation. I know this happens to you. I know life is full of too much of this, but it seems to me that if these conferences are going to be successful, if these conferences are going to be what we hoped they were going to be, certainly we want to enter into the spirit of cooperation and expect to get the same spirit of cooperation back.

Mr. Poston told me today that he was glad to hear that I was in favor of practically all of the things that had been suggested, and that now we sort of had a big brother -- he didn't put it that way, but I can't remember his exact words (Laughter) -- that we now had a big brother who could help enforce some of these things for us that we couldn't do alone. I am willing to believe him. I am still willing to go along, but say, to get back to medicine, the patient still has to be in the hands of the local doctor. The Federal Government is still a consultant that may be called in.

And while there may be people hanging around at the moment hoping for the decease of the patient because of what they may get from the will and the possessions, I am sure that none of us here are really anxious to lose the advantages that we will get and can get from close cooperation, from frequent consultation, from letting them do for us on a national scale with computers, and with specialized equipment and laboratories, which the layman really knows nothing about in making so many of these technical determinations, and certainly which I know nothing about.

I just wanted to get this off my chest. This may be my swan song in this, but I feel very strongly about it.

I am going to ask Lyle Smith now to pick this up, and he can get into what I consider the more picayunish material (Laughter), because it takes skill and knowledge and training to be able to separate the particles and find the ones that are of worth and that can be of some help. So, Mr. Smith, if you will?

MR. STEIN: Doctor, are you available for comment or questions now?

DR. HARGRAVES: Yes.

MR. STEIN: As you know, I do agree with a good deal of what you have said.

As a matter of fact, you know, as was pointed out, we were, I guess, called in here by your family.

DR. HARGRAVES: You are quite right.

MR. STEIN: By your family. The governors called us in. This is the nicest way, really, Doctor, that we have ever been called Federal illegitimates.

DR. HARGRAVES: Well, you see, I'm a physician, where I have to call things, I guess, by the way they happen (Laughter).

MR. STEIN: I am not through.

DR. HARGRAVES: No? I thought you were through (Laughter).

MR. STEIN: No.

Now, of course, you mentioned the period of fifteen years in New York. That is true. New York completely changed their law, completely changed the organization, and I dare say, with respect to people in New York, from the Governor on down, they are not very proud of that fifteen-year record of classification.

The entire procedure is working very, very differently in New York now.

However, you did mention two rivers, and I was a little surprised. One was the Red River of the North, and the other was the Rainy River. On the Red River of the North we did a study, a survey, and the standards have been developed, or the States say they have developed them. Fine. I am glad we could help them.

The Rainy River is a different point. Waters have been misused in the Rainy River.

I remember I came to work with the Federal Water Pollution Control Program in 1948, about the same time as the Wisconsin agency came to work with us. Summer after summer those fellows went to the beautiful, convivial social affairs, not the way we come up here, up to the Rainy River, International Falls. They came back with beautiful brochures, and studies went on year after year after year. They were delighted to come up to the Rainy River.

Part of the solution, I hear, for one portion of the Rainy River solving the problem is that we are going to stop pulping operations here, do that in Canada, give a permit for a pipeline to ship the waste across, make the paper on this side, and then we got a report from some people that it was putting our American families out of work.

DR. HARGRAVES: Our feeling is that Ontario is right along with us, and Ontario will not permit it. If they do it will be the biggest blow to Canadian-U.S. relations in this area.

MR. STEIN: I am sure, sir, that Ontario is along with you, but this is a question we have, and I think this is why the Federal law has been amended all these times, and this is something we have to consider.

Doctor, I don't want to argue with you. A lot has been done on these rivers, but I do think the reason that our law has been amended so many times, and you have seen the increased tempo of Federal activity, is the spectacle that is being presented to the Congress of repeated meetings since 1949 on the problem, when an order comes out in 1965-66.

This isn't unusual.

We were up at New York and on the Lake Erie case, and we discovered an order which had been outstanding since 1908. This may be why the conferees asked us to come in. But these are the only two rivers, Doctor, that you mentioned. However, there is a letter, I think, that Dr. Barr sent to Mr. Quigley, the Commissioner, and this is why I am encouraged on this issue:

> "Such formal classification and enforcement procedures including issuance of orders where indicated, have already been completed for the waters of the Mississippi and Minnesota Rivers in the Twin Cities metropolitan area, and for the entire reaches of the Red River of the North and the Rainy River."

In other words, now, we might argue and talk about philosophy, and you might talk about standards and situations that you will probably face. This is true, but I do think in the area that we are concerned with today, we don't have this impediment, because, evidently, the States have done well.

DR. HARGRAVES: Mr. Stein, do you appreciate that we issued orders on the Mississippi and we went through days and days of classification, and we are still tied up in court?

MR. STEIN: Yes.

DR. HARGRAVES: Regarding the classifications and standards, and we did the same thing for the Minnesota River, and we are tied up in courts there.

MR. STEIN: Yes.

DR. HARGRAVES: The legal speed with which this is settled, of course, will alter what our orders will have to be changed to, but we do not feel even though this has been -- what, five years, six years since you conducted the inquisition -- at any rate, we are still waiting for the court to settle this problem, and it is going to the Supreme Court, because I think it is that important. So we are not quarreling with you.

I am explaining to you that this is the procedure that we have to go through to set standards or classify streams.

We have already set up and have, for both the same type of classification that you have, and they will be applicable State-wide, criteria, if you will, but to put this on every stream and every lake is a problem that has to be wrestled with. This goes back to the legislature.

MR. STEIN: I fully understand your point.

However, on this river and in this problem, we are over the hump.

These are the three areas, the Rainy River, the Red River of the North, and the Mississippi in the Twin Cities area, where there has been extensive help. We are happy to have that here.

Now, we were called in by both governors, and this should be clear. We were asked to come in here. We didn't just come in -- and this is a point that should be made clear -- we didn't just come in because we were asked. As I read this morning, we came here also on the basis of reports, surveys and studies. We came here on our own initiative, as well as being requested to come.

I love these medical analogies, because it is a wonderful thing to hear the doctor, but his point of regarding us as pure consultants that may be called in is a delightful way of putting it. The point is, we are not just here as a consultant. We are here on our own authority to do a job. We also have the role of a consultant because we were asked in by the governors.

Now, this has to be made clear. As to these arguments that the doctor is making, I am not arguing against these things. These arguments that the doctor is making have been made over and over to the Congress.

I think the pollution problem is so big that we all have to work on this together, and this interposition of protecting States' rights doesn't seem to me to be the way to be really conducive to getting at the problem. It just sets up a smoke screen and creates some acrimonious feelings. I think the job is so big that we have to do it.

Now, whether I think that or not, the arguments made by Dr. Hargraves and other State people to the Congress have been plainly and vociferously repeated. The Congress passed a law giving the Federal Government certain powers. I think as Federal officials we have to do a job as conscientiously as Dr. Hargraves and his associates do in his State. We are sworn to uphold the Federal law. We are here to try to do this job in as reasonably and as gentlemanly a way as possible.

The point is that when Dr. Hargraves spoke about the law -- I feel that we are all Americans -- we don't feel we are illegitimates outside the family. We don't feel Wisconsin and Minnesota have a Chinese Wall that somehow is restricted to Federal people. We are all American people. We are a mobile community. People use this country. We are here to work together with the representatives of the State governments.

Now, as far as I can see, there is a strong movement in the States to welcome us in. Certainly from what Senator Nelson said this morning, it indicated to me that he thought our activities were welcome and worthwhile.

DR. HARGRAVES: Of course, any statement can be twisted around as they wish, but I have been welcoming you in.

MR. STEIN: Yes.

DR. HARGRAVES: And I appreciate the work that has been done.

I have simply explained to the people of Minnesota the tremendous problem that lies ahead for all of the waters of the State of Minnesota.

MR. STEIN: They do.

DR. HARGRAVES: We still have 4,000 miles of interstate waters, and many of the tributaries of these large rivers, the Mississippi River, very likely, will be included well on up beyond the Twin Cities.

MR. STEIN: Yes.

DR. HARGRAVES: So that I am quite in favor that we have close cooperation, that we understand each other, that we get together and have conferences; and, as I say, this is an important point in the lifeblood of the entire country of America, because if we don't solve it, why, we are in trouble. We are lost.

MR. STEIN: Dr. Hargraves, I would like to say one thing on that point.

I appreciate your problem with all the waters you have here. I appreciate the problem with the many different fresh waters you have in Minnesota. Even you cite the New York problem as a much smaller one, and I think perhaps you are right. But let me say that the kind of problem that you have is really a blessing. You are blessed with an abundance. In dealing with a water problem, I think we are much better off dealing with something like Minnesota, where you have this abundance of riches and all these waters are classified, than one of these arid Western States, where classification is easy, because we don't have any water and we are dealing with dry stream beds.

The problem here is how to manage the water, and I think in meeting that problem we should utilize our ingenuity and be able to do it, because I think here is the place that we can solve the problem. Whatever you do on the desert with an intermittent stream, all the classification and treatment in the world isn't going to help, but you can be helped here.

I look at Minnesota from the point of view of water quality and water resources as being one of the most fortunate, if not the most fortunate State in the Union.

DR. HARGRAVES: No, but are you trying to tell me that by June, because we cannot hold all of these hearings, you will be happy to classify the other 4,000 miles?

MR. STEIN: No. I don't say I would be happy to do anything.

DR. HARGRAVES: I know, but this is the question that faces us.

MR. STEIN: No, that is not the question.

DR. HARGRAVES: We would like to do it ourselves, but this is our dilemma.

MR. STEIN: Yes, I can understand that. According to this, the point again is I have two specific charges in Minnesota. Specifically, one is on the Red River of the North, where we have the problem met on classification, and the other is here. I don't think that June deadline is going to affect us. In other words, we can discharge our obligations relating to interstate enforcement operations.

The other problem we have, sir -- I ask you to look at this in a sympathetic way, and I have read the Commissioner's comments and have read Dr. Barr's comments and I look at both sides -- is that Congress passed a law giving us a particular deadline. The notion is that if that law is not complied with by that deadline, the Federal official in charge is charged with the statutory obligation to do something. This is the point.

DR. HARGRAVES: This is the point, and I think this is what the people of Minnesota have to understand, that we are at this particular point in history.

I read every bit of the hearings before Congressman Blatnik's committee, and this was one of the prime worries of many manufacturers, of many Congressmen, of many organizations, that none of these things be done without proper hearings and allowing the people to be heard who were going to be most affected. I think Minnesotans should know this, and this is not of our making. That is the Commission's --

MR. STEIN: Again, I am just relating the law and stating the bare facts of the law, and this is what I think should be understood. When the Congress passed the law, in setting up its deadline and requiring the Federal Government to do something about it if the State did not do it within the stipulated time, it, the Congress, also heeded the argument that this should not be done without a proper hearing.

The point is, they made provisions for a hearing in the Federal statute.

I must admit to Minnesotans and anyone in any State that I sympathize with you certainly on this. However, the difference -- and this is the significant difference -- is that if that time comes, these will be Federal hearings in setting these standards, and not State hearings.

M. M Hargraves

I think everyone is agreed that it will be preferable to have this done initially by State hearings. I don't think there is any argument here, but I think the awkward fact remains -- and this should be very clear -- that if standards satisfactory to the Secretary of the Interior are not on file by the end of June of this year, or July 1st, as you know, the Federal Government is under a statutory obligation to act.

Now, as I also understand it, and I don't know what the response will be in the country, only two States out of the fifty are falling behind as much as Minnesota, that is, Minnesota and one other State. The other State doesn't have that much water.

Now, again, and I am talking to the people of Minnesota, Doctor, and certainly to you, if we deal with a busy executive in Washington who looks at the report and sees that 48 of the 50 States may be in substantial compliance, I think the judgment would be that this isn't too bad, possibly, that we will just have to face those two States and do what we can.

We would like to work with you on this. I know Chester Wilson has been with us as part of our group outside this State in other pollution situations throughout the country. We who have worked in this field all know how difficult it is to get a river cleaned up and get compliance.

I am not here to criticize you. I know how hard you work.

DR. HARGRAVES: No criticism whatsoever.

MR. STEIN: Yes.

DR. HARGRAVES: Another point is that we have only that part of the Minnesota River classified from Chaska, if I am right. We still have to go from Mankato to Chaska. We have the Mississippi River classified only so far down to Hastings, or about above Hastings, those several miles, so that all the rest of this river clear down through Lake Pepin in the study area will have to be classified yet under the circumstances which I have outlined. So will the St. Croix, I presume, because we held a hearing there only to have them settle this problem whether they could go in or not, but this has not been made clear up into Polk County.

We have to give a certain number of days' notice of hearings to all of these people. We have a small staff to do it, and I must admit your conference makes me feel pretty brassy, not from what you do, but from the situation.

MR. STEIN: Well, this may be the situation, sir, but, as you said before, and I think this is right, we had up to 32 people working and we put in $750,000, three-quarters of a million dollars. Mr. Poston says not quite that much.

Now, I think the longer a report lies on a shelf or a desk, you are going to find that with the delays that come even now in trying to get this adjusted and putting it out, a good portion of the work that is in here, or several features, have to be altered, and will have to be updated.

Again, we were asked in by the governors, and we came in on our own initiative. We are always faced with this specter, Doctor, of putting in a lot of personnel resources and funds in an area, and coming up with a dry report that is put on the shelf. I have seen to many of these in the Government, and nothing ever gets done about it.

Considering the investment we have made in this area in this report, we should strive to make it viable and see what we can do with it, and what we can do to help clean up this river, and, at the same time, move our program ahead. I don't think we are going to get it cleaned up without moving your program ahead.

DR. HARGRAVES: I agree with you, and I would like this river to be cleaned up too. But, as I say, the people of Minnesota I think should understand where we stand.

We can hold our hearings and we can issue our orders on the data that has been presented. We appreciate that. We appreciate the cooperation we have had, and I would not want this to end with any hard feelings, and none was meant.

This is an explanatory situation because of reasons I think I have adequately covered.

MR. STEIN: Yes. Anything else?

MR. POSTON: I would like to make one comment to Dr. Hargraves.

I am the Regional Director for the Federal Water Pollution Control Administration. We have the Great Lakes region, which includes the Upper Mississippi Basin and the Great Lakes Basin. Some ten States are included in this region and our activities cover grants, enforcements, research, and planning. I would like to assure Dr. Hargraves that any request that he may make of me for assistance or cooperation, I will give my personal attention to.

I have not received any requests, but I do hope that this can be a means for making us work closer together. I would like to add that I have made offers of assistance in some of the other areas.

As I indicated before, my desire is to get clean water. I decided some time in the past that when I forget this objective of clean water, I can get far afield and my efforts come to naught at times because of wandering aside from my major objectives, but I do wish to assure you that within my capabilities I will give personal attention to any request that you make.

DR. HARGRAVES: Well, I can assure you that those of us on the Commission and on the staff are in favor only of clean water also.

MR. WILSON: Mr. Chairman?

MR. STEIN: Yes.

MR. WILSON: May I have an opportunity to make two comments in view of what I consider to be a very urgent situation?

MR. STEIN: Yes.

MR. WILSON: And to comment on the need for an immediate clarification, while the Minnesota Legislature is in session, of the present position of the Federal Water Pollution Control Administration on the proposed program of the Minnesota Water Pollution Control Commission.

As I said this morning, that program was started before the incidents occurred that led to this conference which opened in 1964. It was a very clearly thought out program under our law for the adoption of the standards necessary for enforcement.

Now, there is no time here to discuss the policy and advisability of adopting water pollution control standards.

M. M. Hargraves

As I mentioned, the State of Wisconsin up until 1965 made a very notable progress in dealing with their municipal and industrial water pollution control problems without any standards at all.

A great many leading engineers and authorities used to consider that standards were unnecessary, that it was more effective for water pollution control agencies to do as Wisconsin and the majority of other States used to--deal with each case on its merits, issue orders for the construction of necessary sewage treatment works, and that they got along a lot faster that way if they did not have to go to all the trouble of classifying waters and adopting standards.

However, we are past that point now, because the Federal law requires the adoption of standards.

Now, the old Minnesota law made the adoption of standards necessary only for enforcement purposes. Before the Rosenmeier Act of 1963 was adopted, the Commission could lay out its own program and decide as a matter of strategy where it was necessary to crack down with enforcement proceedings and adopt standards for the areas where the critical cases existed. That was all that was necessary under the old Minnesota law.

Let me show you, ladies and gentlemen, a copy of the most recent issue of the Suggested State Water Pollution

Control Act, published by the Federal Water Pollution Control Administration. The provisions as to standards in that Act are very similar to those in the Minnesota law. They do not contain these intensely complicated and cumbersome requirements of the Rosenmeier Act adopted in 1963, and I want to say that those provisions adopting the highly complicated New York system of classifications and standards were injected into that Act by amendment late in the session without any opportunity for hearings, and without any recommendation by the Water Pollution Control Commission.

Nevertheless, the Commission is now saddled with the additional burden, very time-consuming, very money-consuming, of going through all that complicated process that is required under the New York statute, which has now been loaded on to them.

This situation had already developed when this conference opened in February 1964. The Minnesota Commission under the old law had already proceeded in the summer of 1962 to hold hearings which ran for a period of anyway eight days or so, spread over a period of several months, and adopted standards for the area where the most critical condition existed -- that is to say, in the Mississippi River from Anoka to the mouth of the St. Croix River -- with the intention as fast as time would permit of adopting standards for the other waters of this State in the order of priority, as they determined the need for enforcement action.

Now, I would just like to read something to indicate that the Commission had every reason to believe that that was a sound program which had the approval of the Federal authorities because at the opening, or, rather, just before the adjournment of the opening session of this conference in which we are now participating, three years ago, on February 8, 1964, our Chairman here, Murray Stein, had this to say about that Minnesota program, which was already underway. I am quoting now from Mr. Stein's remarks, which you can read in the recorded record of that proceeding:

> "I do think that if you went around the country and saw how pollution problems were handled, you would realize that in coping with a metropolitan problem as is presented by St. Paul and Minneapolis, your State agencies have done a job--and I can say this after listening to this for several days--which in my opinion is as good as any State has done in dealing with this problem."

Then, later, in the published summary of that session of this conference, I would like to quote this from the official statement received from the Public Health

Service:

> "The Wisconsin and Minnesota water pollution control agencies have active water pollution control programs. The delays, if any, are those which may be expected to occur in the execution of the pollution abatement program of a large metropolitan area."

Then this from the summary of this report which we have been discussing here all day, and you can read it yourself on Page 34. Mr. Wisniewski has already referred to it, and I agree with him that there was a serious omission when Wisconsin was not mentioned along with Minnesota.

"In light of the excellent progress"

-- get that, ladies and gentlemen --

> "In light of the excellent progress the Minnesota Water Pollution Control Commission had made in making various industrial firms and municipalities aware of the need for abatement facilities, the following time schedule for the foregoing remedial program is recommended."

There is nothing in all of those statements to indicate that anybody thought that the Minnesota Water Pollution Control Commission, along with Wisconsin, was slacking or lacking or lagging in attacking this program with the utmost vigor.

And now, what is the situation? It has been precipitated, this very difficult dilemma which we are in at the present time, by the Federal Water Pollution Control Act Amendment of 1965, particularly by this language -- I won't read it all, but the substance of it is that in order to comply with the provisions of this Federal Water Pollution Control Act as enacted in 1965, since the initial session of this conference, the State, before June 30, 1967 -- that is this year, only a few months away -- must first file a letter of intent that they will before June 30 adopt water quality criteria applicable to interstate waters in the portions of such States, and (b) a plan for implementation and enforcement of the water quality criteria adopted.

This situation has been precipitated because the head of the Federal Water Pollution Control Administration has now completely switched around from a position that was stated by Mr. Stein and told the Minnesota Water Pollution Control Commission that their strategy and their plan will not meet the requirements of the Federal law.

Now, that statement has been picked up by members of the legislature who are called to be critical of the Water Pollution Control Commission, and every other State agency which, in their opinion, or in the opinion of some of their constituents, has fallen down on the job.

M. M. Hargraves

In my opinion, it is an outrageous injustice to the hard-working, unpaid citizen members and the hard-working and certainly not overpaid official members of the Minnesota Water Pollution Control Commission to be attacked in any measure for the work which they have done above and beyond the call of duty in trying to come up with this water pollution control program.

(Applause.)

This position of the Federal Government has discredited the Commission and fed fuel to the fire of the critics of the Water Pollution Control Commission in the Minnesota Legislature, with the result that they are even now talking about wiping out the present Commission and reorganizing them.

Now, that is one of the common practices of the legislature. Every time something goes wrong, for which the legislature is usually at fault for not furnishing the salary scales, not furnishing the money to provide the necessary competent people to do the job, the legislature tries to cover its own shortcomings either by passing some kind of a law or by reorganizing the outfit and still doesn't give them what it takes to do the job.

The legislature can reorganize this, or any other State agency. I have been through several reorganizations, and I am here to say this: Ninety percent of the success of any enterprise depends on having good people to carry it on, and even though they have an imperfect organization, if you have an adequate staff of competent people with money enough to do a job, they will get a job done. You can have the most perfect organization in the world, and if you don't give them the staff and the money to do the job, it will not succeed.

Now, if this position of the head of the Federal Water Pollution Control Administration continues through this session of the legislature, what I am afraid of is that the action of this legislature will be no help to the program whatever. It may result in a reorganization, a totally new body of men taking over the functions of this hard-working Water Pollution Control Commission, which over the years has gained a tremendous amount of knowledge of this problem and willingness to contribute their services to the public welfare. That will delay the program, if there is a reorganization.

Furthermore, if, as has been intimated, the Federal Government has to come in here after June 30th and hold these hearings on 4,000 miles of streams and then adopt the standards, they are probably going to come out with about the same standards that would have been adopted much sooner by the Minnesota Water Pollution Control Commission if it had been permitted to carry on its plan and program.

I can't see what slightest advantage can occur to the advancement of these tremendously difficult jobs by having the Federal Government step in here and take over this whole thing, but there are even some members of the legislature who are willing to lie down and let them do that, who say, "Well, okay. If the Federal Government wants to come in here and spend the money, why, let them do it."

To me, that would be a terribly shameful thing for the people of the State of Minnesota, who, along with the people and agencies of the State of Wisconsin, are able to take care of this job themselves.

There is widespread complaint all over the country about the encroachment of the Federal Government on local agencies, and it has been due almost entirely to the fact that State legislatures and State agencies have not done a good job on some important measure of the public welfare.

Here is an example of where an outstanding job, recognized, as I said, by Mr. Stein, who knows this problem as well or better than any man in this country, is on the way to being discredited with a gross injustice to these hard-working members of the Commission, simply because of this arbitrary decision taken by the head of the Water Pollution Control Agency, and I think that if there is anything that can be done while this legislature is in session to secure a reversal of that position, to secure a firm statement that the Federal Water Pollution Control Administration recognizes the difficulties with which the Minnesota Water Pollution Control Commission has had to cope and is ready to stand behind it, that would do more to expedite the solution of these difficult problems than anything I can think of. However, if the Federal Government persists in this position which has already been taken by the agency and the Water Pollution Control Commission is discredited, you may be very sure that the ultimate solution to these problems will be delayed much longer than it could have been accomplished if the Federal Government stands behind the Commission and backs it up in the sound program which it has undertaken.

MR. STEIN: Mr. Wilson, you spoke for the record.

I do not want to belabor this, but you made the statement repeatedly that the head of our Agency took an arbitrary position.

How was that arbitrary?

MR. WILSON: What?

MR. STEIN: I'm sorry. Chester, you said that the head of the Agency has taken an arbitrary position.

Would you specify why you think that was arbitrary, and how it is arbitrary, considering what the law says?

MR. WILSON: I think that he has misconstrued the law.

It is an axiom among administrators, and let me say that I have had long experience in both administration and law, twelve years as head of the Minnesota Conservation Department, seven and a half years as Chairman of the Minnesota Water Pollution Control Commission, and I discovered by long experience that there is more than one way to skin a cat. I think that the head of the Agency has taken a very narrow view.

Laws are supposed to be construed in accordance with their intent. If there is any intent that is emphasized in this Federal Act, it is that the State agencies should be given the first opportunity to deal with every problem, and that I know of from having presided over some of the largest hearings ever held by the Federal Water Pollution Control Agency.

It is the policy of the Act to give the State agencies the first chance to deal with every problem, and by the position taken by the head of the Agency now, that chance is being cut off. I do not think that that is necessary, and that is why I say that the position of the Agency is arbitrary and was not in accord with the spirit of the law.

MR. STEIN: Thank you, Mr. Wilson.

I think I just have to say this for the record, and I don't think this is any place to prolong a discussion. I think the statute is clear. It says criteria from the States have to be set up by June 30th of this year. I think the Congress and the committees abundantly indicated that they expected this to be done at that time.

There have been various discussions in the Administration. The Commissioner, the head of our Agency, has discussed this with Department Counsel, the Department of Justice has been over, the Secretary of the Interior has reviewed it and talked this over with the chairmen of the committees who developed the legislation and with counsel to the committees. I think they are all in complete agreement that the law means what it says, and the Commissioner is proceeding within the intent of the statute.

Obviously, lawyers have differences on the law, but I am saying this just so that the record will be clear.

Are there any further comments or questions?

(No response.)

MR. STEIN: Mr. Smith?

MR. SMITH: Mr. Chairman, I have two statements, one on progress which will take fifteen minutes, and then comments on individual recommendations, which will take three-quarters of an hour to an hour.

MR. STEIN: Let's take the first portion and we will see how the people feel after you are through with that.

STATEMENT OF LYLE H. SMITH, CONFEREE
AND EXECUTIVE ENGINEER, MINNESOTA
WATER POLLUTION CONTROL COMMISSION

MR. SMITH: I should like to bring you up to date on the progress that has been made since the last report, and some of this will prove to point out the fact, as the Chairman has said, that the report is somewhat stale already in some areas.

First, liquid storage.

Regulation WPC 4 relating to the storage of oil and other pollutional liquids was adopted by the Commission in June 1964. This regulation requires adequate diking of facilities, use permits, and reporting of spills. The enforcement program has been rather limited because of lack of staff.

Classifications and Standards

Classifications and standards were adopted by the Commission for the reach of the Mississippi River from Anoka to Hastings in 1963, before the convening of the first session of the conference.

In the interim, the Commission also has adopted classifications and standards for the Minnesota River from Carver Rapids to the mouth. These are Regulations WPC 5 and 6, which were adopted in November 1965.

The Commission also developed statewide water quality criteria applicable to all waters of the State, both interstate and intrastate, completed the required hearings, and probably will adopt them in the near future. The criteria are one part of the requirements placed on the State by the Federal Water Pollution Control Act. An implementation and enforcement plan for the interstate waters is also being prepared and will be submitted, together with the criteria, by June 30, 1967.

Metropolitan Sanitary District

The 1963 legislature required that a comprehensive sewage works plan be prepared by the Minneapolis-St. Paul Sanitary District and reviewed by the Water Pollution Control Commission.

The District submitted a report to the Commission with a plan for a comprehensive sewage works plan to serve nearly all of the metropolitan area. A hearing on this plan was held by the Commission on November 4, 1964, and a report to the 1965 legislature was submitted with recommendations for implementation of the plan. It was recommended that the administration of this comprehensive engineering plan and construction of the facilities described therein should be done by a metropolitan sanitary district composed of all towns and municipalities within the service area outlined in the plan, including Minneapolis and St. Paul and suburbs, replacing the existing Minneapolis-St. Paul Sanitary District. Creation of this district would require a special act of the legislature.

After considerable debate and controversy, particularly regarding methods of financing, a bill designed to enlarge the Minneapolis-St. Paul Sanitary District to provide service to the area described in the Comprehensive Sewage Works Plan for the Twin City Metropolitan Area failed of adoption in the 1965 session of the legislature. However, efforts will again be made in the 1967 legislature to pass an act of this kind, since there is still a critical need for such a district to do the planning, financing, construction and operation of interceptor sewers and sewage treatment works in this metropolitan area.

MR. STEIN: May I ask a question to clarify this? Does that bill take in that big area you were talking about, or just that modified plan?

MR. SMITH: There are several bills. One bill takes in the whole seven-county area, and even an additional area outside of the seven counties. Another bill is more limited in its scope.

MR. STEIN: Both bills are still alive?

MR. SMITH: Yes. Our session of the legislature started in January, and it runs until May 22nd. These bills are still being considered by the committees or subcommittees of the various legislative groups.

MR. STEIN: Are you concentrating on one act, or does it still go to both acts? They are two competing acts.

MR. SMITH: I shouldn't say two. There are about a half dozen right now with various aspects, and the Commission has not supported any particular bill.

MR. STEIN: Oh, you have not?

MR. SMITH: No.

MR. STEIN: All right.

MR. SMITH: These haven't gotten to that stage.

MR. STEIN: Very well.

MR. SMITH: SOURCES OF POLLUTION.

The statement presented by the Commission at the first session listed all sources of pollution in the study area with a brief statement regarding their status.

In the interest of brevity we shall discuss here only those sources which have made significant progress in the interim. However, information on all of the other main stem sources, including those considered satisfactory, those which are essentially unchanged, and known existing or potential sources not actually discharging yet, will be furnished if desired.

Municipal

I would like to take up the municipal portion first. The following municipalities within the study area have made improvements as indicated below.

Minneapolis-St. Paul Sanitary District

In the spring of 1964, the District initiated construction of secondary treatment units which are designed to increase the plant capacity to 218 MGD. These facilities are designed to provide about 75 percent reduction in BOD and 85 percent reduction in suspended solids based on the modified activated sludge process, or an effluent strength of about 65 mg/l 5-day BOD and about 50 mg/l suspended solids. Provision is also made in the layout and design of plant units to increase the future capacity to about 400 MGD and the BOD removal to at least 90 percent, or an effluent of about 20 to 25 mg/l of 5-day BOD utilizing the step aeration activated sludge process.

These facilities are the result of engineering studies of the future needs for sewage works in the Minneapolis-St. Paul Metropolitan Area which were started in 1956 and updated by another engineering and financing study completed in the fall of 1965 in accordance with Laws of 1963, Chapter 882.

The secondary treatment units are in operation, however full utilization cannot be made of these treatment units until the sludge filtration and incineration facilities are completed as scheduled for August 1967. Trial operation of the secondary treatment units for treatment of the full sewage flow in May and June 1966 showed an average reduction in BOD of about 77 percent. Experience, however, showed that the existing sludge disposal facilities were not capable of disposing of the increased quantity of waste sludge produced, consequently plant operation was adjusted to treat about one-third of the flow by secondary treatment and two-thirds by primary treatment until the additional sludge disposal facilities are completed. This method of operation from July through September 1966 accomplished an average of about 47 percent reduction in BOD of the sewage.

In May, 1966, the District received a 50 percent

Federal grant in the amount of about $870,750 under the Federal Water Pollution Control Act to aid in reconstruction of about 15 major regulator stations on combined sewer overflows in the Twin Cities. This project was the first in the country to receive a grant offer under this program and is to demonstrate a new and unusual method of reducing the volume of sewage carried by storm water to the Mississippi River during and following heavy local rains.

South St. Paul

The city is presently having plans and specifications completed for a new interceptor sewer and the first stage of construction of improvements to the sewage and industrial waste treatment facilities. Contracts for construction of these facilities are expected to be awarded soon. The city also applied for a 50 percent demonstration grant under provisions of the Federal Water Pollution Control Act for separation of the industrial waste from the other combined sewers.

Inver Grove Heights

The village constructed a new contact stabilization activated sludge plant with a capacity for 0.5 MGD of sewage flow, replacing the small aeration plant serving South Grove Subdivision of the former Inver Grove Township. This plant is like the Burnsville and Newport plants and is capable of 90 percent reduction in 5-day BOD of sewage.

Hastings

The city has completed plans and specifications for a new modified activated sludge treatment plant which will more than triple the capacity of the present primary treatment plant and will provide secondary treatment. Construction of these improvements is scheduled to start this spring. This plant will have a design capacity of about 1.83 MGD and will produce an effluent of about 50 mg/l 5-day BOD or about 80 to 83 percent reduction in BOD.

Lake City

The city initiated construction of a new modified activated sludge treatment plant in the summer of 1966. This plant replaces an existing inadequate primary plant. It has a design capacity for sewage flow of 500,000 GPD and is expected to produce an effluent of about 50 mg/l of

5-day BOD or about 75 to 80 percent reduction in BOD. The plant is nearing completion.

Burnsville and Eagan Township

After public hearings the Commission granted variances from the classification and standards for the Minnesota River to permit Burnsville and Eagan Township to construct temporary treatment works and discharge the effluent into the river until interceptor sewers and sewage treatment works are planned and constructed by a sanitary district or other area-wide service agency. It is estimated that these temporary treatment facilities now under construction will serve until 1970 to 1975 as the case may be. This should be sufficient time to plan and construct needed interceptor sewers and sewage treatment works under a metropolitan plan providing legislation creating a metropolitan sanitary district or authority to plan and construct these facilities is passed by the 1967 Legislature.

The Burnsville plant is a contact stabilization modification of the activated sludge process designed for 1.0 MGD (million gallons per day) to increase the total plant capacity to 1.5 MGD. These temporary plant units should provide about 90 percent removal of 5-day BOD.

Eagan Township is constructing two small temporary aerated sewage stabilization ponds with capacity of 150,000 and 75,000 GPD. These ponds are expected to provide at least 80 percent removal of 5-day BOD and will serve limited residential and commercial development in the township.

Bayport

The village constructed a new sewage treatment plant in 1964 to provide about 90 percent removal of 5-day BOD using the contact stabilization modification of the activated sludge process. The plant capacity of 650,000 GPD (gallons per day) also provides capacity for the sewage flow from the State prison.

Industrial

Now, on the industrial side.

Minneapolis Water Treatment Plants

Engineering studies are being made to improve treatment, including possible reuse of lime and settling of filter backwash.

Northern States Power Company, Riverside Plant

A company report of river temperature studies was received and shows that after adequate mixing the river water temperature will be below the 93°F limit specified in our present standards. Re-evaluation of the need for cooling facilities will be necessary if the stream standard must be changed to 86°F.

Twin City Shipyard, Inc. (St. Paul and Burnsville)

The company provided treatment consisting of settling, screening and filtration.

Cenex, Inc. (Formerly Northwest Cooperative Mills)

Interceptor ditches and pumping facilities were provided to intercept leakage from the gypsum pond.

Northwestern Refining Company

A flue gas stripper and higher diking to protect the oil recovery ponds during flood stages were installed.

Minnesota Mining and Manufacturing Co.

Additional treatment facilities are under construction, including equalization, neutralization and biological treatment by the activated sludge process.

H. D. Hudson Manufacturing Co.

Facilities were provided to treat metal finishing wastes by chemical precipitation.

Honeymead Products Co.

A flood wall for containment of oil spills and waste treatment facilities consisting of aeration, neutralization, skimming and settling were provided by the company in 1966.

Minnesota Valley Milk Processing Cooperative Association

Secondary treatment facilities consisting of an oxidation channel system were provided by the company in 1966.

L. H. Smith

American Crystal Sugar Co.

The company provided a treatment and recirculation system consisting of a mechanical clarifier and a sludge pond. All process waste is to be recirculated for reuse in the plant, and only cooling water will be discharged.

Rahr Malting Company

The company has authorized construction of a screening and flow equalization system which is an essential step toward joint treatment with Shakopee. Studies on joint treatment are being made by engineers employed by both the company and the city.

M. A. Gedney Co.

The company formerly discharged its waste to the Chaska system, but this proved unsatisfactory and the company subsequently constructed separate stabilization ponds.

I know that a number of municipalities and industries listed in this interim report are present and have indicated that they would like to make statements which will be in more detail.

MR. STEIN: Dr. Hargraves asked that we put a question at this time. May we have a show of hands for those who feel they want to make statements?

(There was a show of hands.)

MR. STEIN: Thank you very much.

MR. SMITH: Some of them are not present now.

MR. STEIN: Is this a good time to break?

MR. SMITH: This is a good time to break. Our next portion would be to review in detail the recommendations of the report.

MR. STEIN: Off the record.

(Discussion off the record.)

MR. STEIN: We will stand recessed until nine o'clock tomorrow morning.

(Whereupon, at 4:45 p.m., an adjournment was taken until Wednesday, March 1, 1967, at 9:00 a.m.)